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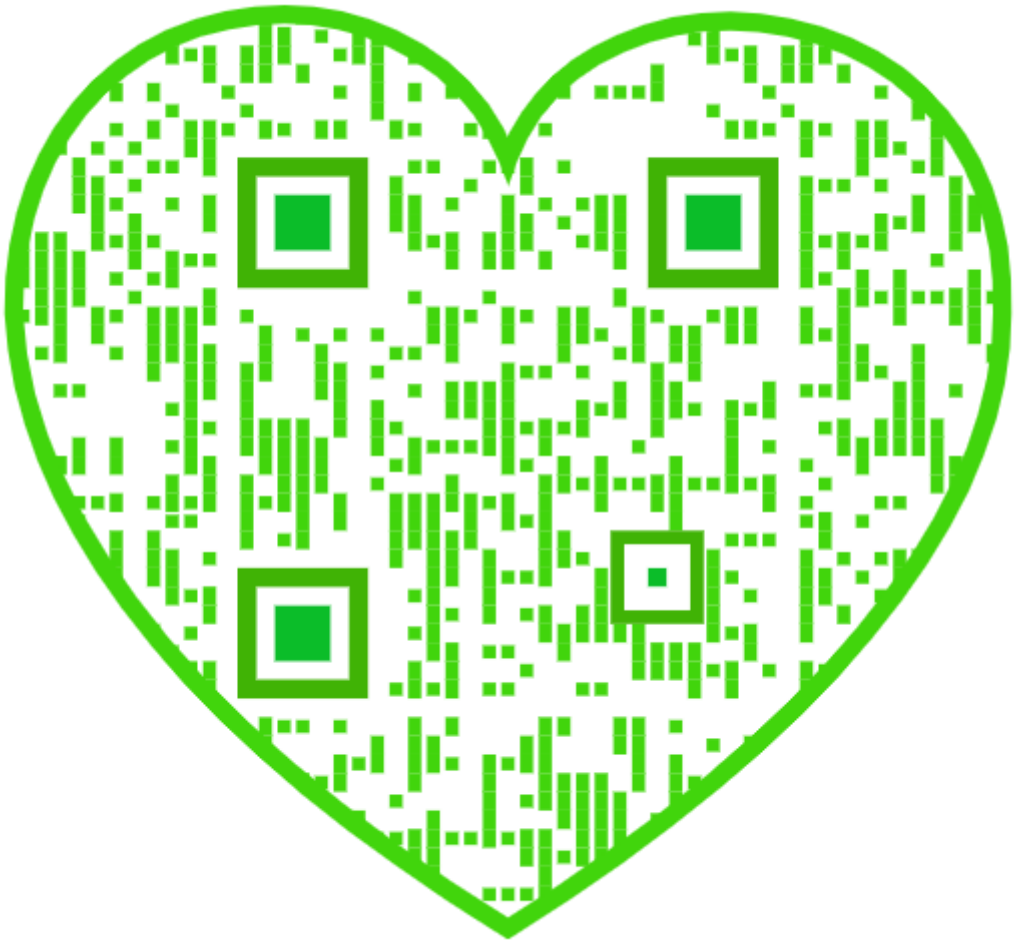

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THE

DIAGNOSIS, PATHOLOGY,

AND

TREATMENT,

OF THE

DISEASES OF THE CHEST.

BY

W. W. GERHARD, M.D.,

LECTURER ON CLINICAL MEDICINE TO THE UNIVERSITY OF PENNSYLVANIA, ONE OF THE PHYSICIANS TO THE PENNSYLVANIA HOSPITAL, ETC.

THIRD EDITION, REVISED AND ENLARGED.

PHILADELPHIA:
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Entered, according to the Act of Congress, in the year one thousand eight hundred and fifty, by
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TO

CASPAR W. PENNOCK, M.D.

My Dear Pennock,

It gives me very great pleasure to inscribe this little work to you. The subject was for a long time an object of our mutual study, and must bring to your recollection many happy hours which we spent in its pursuit. With my best wishes for the entire restoration of your health, I inscribe myself,

Yours, very sincerely,

W. W. GERHARD.

PREFACE

TO THE THIRD EDITION.

ANOTHER edition of this work having been called for, I have endeavoured to meet the wishes of the profession by adding such new information as may seem of undoubted importance. This edition contains a variety of new matter, besides a more full development of many portions of the former one. I have, also, added a statement of the effects of the cod liver oil in the treatment of consumption, as well as an account of the Spirometer, a new instrument for ascertaining the condition of the lungs.

W. W. G.

Philadelphia, June 1st, 1850,
301 Walnut Street.

PREFACE.

To SUPPLY the wants of his class, and of others who felt an interest in the subject, the author published, in the year 1835, a short treatise on the diagnosis of thoracic diseases, embodying what was most important in reference to the physical and general signs; this manual did not include the treatment, and was found upon experience to be less complete than was desirable. At the request of many of his pupils, he published a series of lectures during the years 1840–1, in the Medical Examiner, which with some additional lectures were collected into the first edition of the present work.

The form of lectures in the first edition was retained as the most convenient; some of them were condensed by a careful hand from the oral lectures of the author; the greater part, however, were written by himself, forming the substance of the course. They necessarily were less full than the lectures as delivered, and the illustrations were of course excluded; but they comprised the most important parts of the subject, such as are most worth being remembered, and seem essential to a knowledge of the subject. In the present edition the work is thrown into the usual form of chapters, divided according to the subjects of which they treat. The whole work has been revised, numerous corrections have been made, and a considerable quantity of new matter has been added. It was not thought advisable to increase very materially its size, so that it retains a form which is convenient for most purposes; at the same time every point of much interest has been developed.

Few references are made to authors; these seemed unnecessary, for the history of the diseases of the chest is so well known that there is little difficulty in determining the source from which the recent discoveries have originated. The publication of the work of Laennec on mediate auscultation gave precision to the history of a class of diseases in which it was before unknown, and, as was soon found, the labours of this admirable observer, far from diverting attention from the observation of the rational symptoms, rendered them more available for diagnosis.

Andral, if not the first to discover the bronchial respiration, was the earliest to point out its value; but his most important labours as regards the diseases of the chest, are the complete history which he has given of their symptoms and pathological anatomy.

The publication of the work of Dr. Louis on Phthisis was another important step in the history of pectoral diseases; it developed the pathological anatomy and symptoms much further than had hitherto been done, and rendered the diagnosis of consumption vastly more perfect. Since the publication of Dr. Louis's work, the additions made to the history of phthisis and pectoral diseases in general, have been much less important if taken singly, but in the aggregate are far from inconsiderable. The pulmonary diseases of children are much better understood, and are known to be more frequent causes of death than those of any other organ of the body; and amongst the affections of adults the pathology of phthisis has been studied in connection with a general diathesis, or tuberculous predisposition, and not merely as a disease limited to the lungs. The therapeutics of phthisis have advanced to some extent, but in a less degree than the natural history of the disease.

The diseases of the heart were but imperfectly known to Laennec; later investigations, especially those of Bouillaud and Hope, have added more to their pathology than had been done for almost a century before. The therapeutics of these diseases have been, perhaps, more immediately improved by recent pathological investigations than those of any other affections.

Within a few years past very good treatises on auscultation have appeared from Drs. Barth and Roger, Walsh, and others; these have, in a great degree, replaced the earlier publications of Drs. Graves and Stokes upon this subject. They, none of them, however, enter much into the general symptoms of diseases of the chest, but are exclusively confined to the physical signs.

The object of the present work is not limited to auscultation, it includes, on the contrary, the general symptoms and treatment; and I may hope that it will prove useful to those who require a publication of the kind.

Philadelphia, March 10th, 1846 }
301 Walnut Street. }

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DISEASES OF THE CHEST.

CHAPTER I.

USES OF CLASSIFICATION IN THE STUDY OF DISEASE—COMPARISON OF PHYSICAL AND GENERAL SIGNS.

In the study of diseases of the chest, as well as those of other cavities of the body, the classification adopted for the convenience of the pupil must often be arbitrary and imperfect. Diseases which are naturally closely connected together, are separated into artificial subdivisions, while others which are essentially dissimilar are brought together in a manner which tends to lead the mind of the pupil from the study of their true relations; still, the artificial divisions which have been admitted for a long time, are in general the most easily recollected, and for purposes of study possess many advantages; while the erroneous conclusions to which an artificial classification sometimes leads may be obviated by attention to real points of similarity, and the natural connection may finally be re-established after it has been for a time broken up. There is thus a double task for the author or teacher: first, that of analysis, for the purpose of discovering and pointing out isolated facts; next, that of synthesis, or of bringing together those which present, in common, strongly marked fundamental characters. Both of these tasks must be kept in view, or the true scientific connections of disease may be forgotten, and the diagnosis will be merely local, and therefore imperfect, instead of being based on correct and enlarged data.

The very division of diseases into those belonging to the

several cavities of the body, is, in a great degree, artificial; and although many of these affections are strictly local, or nearly so, there are others which are nothing more than evident shoots from a diseased root, which extends itself widely throughout the body. In these cases the disease, when it shows itself in the chest, is readily recognised, and is taken as a sign of the general disorder. Sometimes the local disorder grows rapidly, and becomes the prominent malady; but in all such cases it is only a sign of a deeper and more extended mischief.

The remarks which are applicable to the study of disease, are naturally extended to the means of discovering it. These are separated according to the various methods of investigation resorted to, whether founded on the general symptoms or the physical changes of the part; and they are more or less deceptive without a careful comparison, or collation of them, one with another. This is not done by a smatterer in pathology or in diagnosis; hence, the conclusions attained by him are uncertain, and cast discredit upon medicine, and especially on exact diagnosis. The rules of true philosophy, as applied to medicine, do not differ from those of any other science. The same mental discipline, and the same rules of philosophising are required; and, with equally ascertained data, the same degree of certainty may be attained. We must first separate a group of facts into detached elements, examine them in every practicable way, and then bring them together again, and reinstate them in a regular and natural order.

In all departments of science, especially the natural sciences, with which medicine is so closely connected, we examine the objects of our research in two ways: first, as actually existing; and, secondly, as past. The objects actually present, are known by evident signs; those past, are discoverable by the more obscure traces which they have left behind. We thus discern the modes of a disease, just as we learn the habits of a plant or an animal, from its footsteps, or the remains of its food; and we can, in either case, learn the peculiarities which have characterized them during life, or during the continuance of the diseased action, by phenomena actually occurring, or the changes consequent upon them. We are therefore obliged to discriminate in the study of

disease, between those phenomena which are actually going on, and those which have terminated and are no longer of mischief; this obviates many grave errors, and prevents a disorder from being confounded with the lesions which often constitute the proof of its cessation, or it prevents us from mistaking the actions which are in their nature mischievous, for those which are useful and salutary. The latter error is one of more frequent occurrence than the former, for the severe diseased action may require for its removal a slighter, but more permanent deviation from the healthy functions of the part. And although this secondary disorder would, if occurring singly, constitute a disease, it ceases to be one when it is merely a curative agent which exerts a favourable influence with the primary affection. These diseases are often very similar to blisters, or other powerful revulsive means, truly curative, and they then only become injurious when heedlessly meddled with.

The recognition both of the primary and secondary disorders, is more easy in affections of the thorax than in those of other cavities of the body, from our possessing the advantage of two distinct modes of investigation. These are the altered functions, including both those of the viscera of the thorax and of the rest of the body, and the physical signs offered by the diseased organ. The general symptoms of thoracic diseases are learned in the same way as those of other organs of the body; but the physical signs, on the other hand, are so much more applicable to chest affections than to any other disorders, that they are, in practice, with a few exceptions, used only in the diagnosis of the diseases of this cavity, and are generally described with direct reference to the chest. This peculiar fitness of the physical signs for the study of pectoral diseases, depends upon the conformation of the thorax and the structure of the organs contained within it. These are important viscera,—the lungs and heart, which are organs possessing different degrees of density, and constantly in motion; so that certain sounds are produced which serve to distinguish the healthy from the diseased action. Hence we may, from the examination of the thorax, not only ascertain the density of the organs when at rest, but we may, with great certainty, discover whether they act in a regular and natural manner, and what im-

pediments interfere with their motion. These advantages are not offered by the viscera of any other cavity; for although the physical properties of them are sometimes sufficiently marked to enable us to detect variations in form, or in density of tissue, they are scarcely ever susceptible of sufficient motion to cause an audible sound by their own contraction, or by the passage of a fluid throughout their cavity. The physical signs are, therefore, chiefly adapted to the investigation of diseases of the thorax.

Physical exploration is much more extended in its application when combined and compared with the rational signs, than if used alone. For in itself it teaches us rather the condition of organs as modified by disease, than the manner in which the disease forms, or the mode in which it advances. This is especially the case in the chronic diseases of the chest, which depend upon a general vice of the economy, for in order to distinguish disease from health, by the physical exploration of the lungs and heart, it is necessary that a change should occur in the structure of the tissue,—and as this alteration is only brought about slowly and gradually, we cannot always decide whether the tissue is or is not diseased to some extent; if it be diseased in a degree not sufficient to produce an important change in the conformation of the part. There is, therefore, no means of arriving to a correct conclusion in the diagnosis of pectoral diseases, other than a union of the two modes of investigation, which will then work together as two different ways of arriving at the same end. When physical exploration is properly understood, and compared with the symptoms, it will be found to be even more useful for its negative than its positive results; that is, it will be more useful as a means of showing that some diseases do not exist, or that a given disease has not arrived at a point of structural disorganization sufficient to endanger life, than as direct evidence of the mischief already done to the organs. The positive evidence derived from physical exploration is so simple and easily discovered, that after acquiring a certain familiarity with it, little attention is required to discover the full value of the signs: the negative evidence, on the other hand, is much more difficult—for a thorough knowledge of the means of examination, and much practice in using them, are required to pronounce with certainty as to the existence of

slight alterations of a part, or the absence of decided structural change. But when the necessary familiarity is acquired, the certainty of the knowledge obtained from this source is such, that we may rely upon the negative evidence as confidently as upon the positive signs, especially when compared with the indications derived from general symptoms.

The great value of the negative evidence of physical exploration depends upon its certainty. The process of reasoning which renders negative evidence of value in diagnosis, is called reasoning by way of exclusion; but, although it is of great utility when skilfully applied, it is useless unless a disease is announced by positive signs when it exists, and then we may look upon the absence of these signs as a proof that it is not present. If, on the other hand, the signs themselves be doubtful, the absence of them is of course no proof that the disease does not exist; or if these signs be of such nature that we can ascertain them with extreme difficulty, they lose the advantage of serving both as negative and positive evidence. Now, in the diseases to which physical exploration is applicable, this is not the case. The signs are, in general, very easily ascertained, and are always, under similar circumstances, the same; hence they may be used in the way of exclusion with great confidence; that is, when they are not discovered by one who is familiar with the means of exploring them, they may be confidently said not to exist. This negative evidence, as I have already stated, is useful in two ways: first, as evidence that there is no disease at all existing; secondly, as evidence that there is no great change of structure. The first requires that the general symptoms should agree, as it were, with the physical signs, in proving the integrity, or the comparative soundness of the part. The second requires that the physical signs should be, to a certain extent, contradicted or disproven by the general symptoms. But, as this seeming discrepancy is applicable only to the degree of the alteration, and not to its nature, there is, in fact, no real contradiction between the two means of examination. On the contrary, they will be found, when compared together, to accord singularly in the principal deductions which are drawn from each of them.

The extent of application of the physical means of exploration

is, perhaps, novel to many persons who are not familiar with the beautiful application of the laws of diagnosis, by way of exclusion, in which the certainty of the physical signs renders them even more useful, than in other cases in which a precision approaching to mathematical correctness is required; but this very certainty may render them an occasional source of error with those who are neither accustomed to their use, nor perfectly familiar with the ordinary symptoms of disease. That is, an art which is evidently based upon fixed physical laws, may lead to error when the data upon which the problem of diagnosis is founded are not perfectly settled, although the process of reasoning may still be the correct one. But, the abuse of a certain method of observation does not constitute a real objection to its employment; it merely proves that it is necessary to surmount the first difficulties which attend its acquisition.

The great importance of the comparison of the general symptoms and physical signs has become more apparent with the more habitual employment of physical exploration, as a really practical aid to diagnosis. The earlier writers on auscultation, especially Laennec, were rather disposed to separate physical from symptomatic diagnosis: this error depended upon the novelty of the art, and the overstrained efforts to extend its application,—but as physicians became more familiar with it, and had opportunities for testing its merits, it was placed on its real footing, and regarded as more useful than any symptoms taken singly, but as neither the only class of symptoms to be relied upon, nor as superseding the general signs. We are indebted to the French pathologists for pointing out the necessity of comparison of all the symptoms of pulmonary disease, and of connecting this comparison with their succession in order. It is a subject largely insisted upon in the writings of Andral, but one which was most completely developed in the lectures of Dr. Louis. It afterwards received much attention from Dr. Stokes, and others, who have occupied themselves with the study of pectoral diseases.

Although it is not at this time necessary to insist upon the truth of the physical signs to those who are conversant with their use, their certainty may still appear questionable to a few who are not practically acquainted with them. As these signs are

based upon the settled laws of physical science, and in fact involve some universally admitted principles, the only reason for doubting their accuracy is a want of due knowledge on the subject. But as a certain acquaintance with them is necessary to appreciate the evidence upon which they depend, I may properly enough point out what is included under the terms physical exploration and physical signs. Physical exploration includes the modes of ascertaining the changes which occur in the physical structure of organs; these changes we appreciate by the alterations of form, and by the sounds produced in the interior of the body by the motion of solids, or of elastic or non-elastic fluids, or by the resonance which is yielded by the surface when tapped or struck by the finger. This latter mode of examination obviously depends upon the different density of organs, and in the cavity of the thorax, chiefly upon the existence of air, so that the percussion is more or less clear or dull, as the quantity of air contained within the thorax is greater or less. The alterations of form are few in number, and are readily learned; but the signs dependent upon changes in the sounds produced by the passage of air and of blood within the thorax, or the resonance of the air when thrown into motion by the act of speaking, seem comparatively difficult, and involve more complicated phenomena. The same remarks are applicable to the signs of percussion, which are not a little difficult; but in either case, the sounds are regularly and uniformly the same under similar circumstances.

The difficulty in learning the physical signs thus consists in two distinct points; first, in the acquisition of the sounds themselves, considered as simple phenomena; secondly, in the knowledge of the condition of the organs which corresponds to these sounds. The sounds themselves require not only to be learned well enough to be understood, but they must be fixed so thoroughly in the mind that no room should be left for mistaking one for another. This demands time, attention, and organs of hearing which are not physically incapable of discriminating between sounds which at first may seem nearly similar. The first difficulty is surmounted; there still remains the other, which requires a knowledge of many circumstances which are connected with the pathology of the disease. These are those which relate to

the physical condition of the viscera, or the pathological anatomy of the parts, and to the functional action of the organs, which is necessary for the production of most of the sounds. Hence the knowledge of the physical means of exploration requires no little time and attention, and cannot be learned in a careless or hasty manner.

There is, therefore, this impediment to the study of the diseases of the chest, and of physical exploration, that the act itself is a matter of difficulty, and requires more labour than is willingly bestowed upon it. The whole process of investigation requires this attention; even the manual or mechanical precautions necessary to be taken, are not to be learned at the first trial, but require time in the performance of this art, like that of every other; for the ear and hand are not at first capable of the delicate and varied actions necessary for the satisfactory exploration of the thorax. But, although the apparently complex nature of physical exploration may prevent many from attempting its study, the difficulties which at first present themselves are readily enough removed by patient and laborious attention, and are more than compensated by the certainty which results from a mode of investigation based upon fixed physical laws. Every step in the acquisition of this knowledge is appreciable, and in proportion as it becomes more accurate, the diagnosis of disease assumes a new character, which is never acquired when confined to the functional symptoms. This is true even at present, when the comparison of local and general symptoms to which I have just alluded has rendered the latter much more clear, and their value better defined. The physical signs have served as a point of departure, with which to compare the rational symptoms, and have thus rendered the latter more easy of recognition, and more positive in their relations with the internal lesions of the thorax. This is so obviously the case, that a glance at the works of any of the later writers upon the subject, is sufficient to show that the rational signs have become of more practical service for the study of diagnosis than they have ever been before, and that many of these symptoms have been investigated with a care which was never before bestowed upon them. Some symptoms,

it is true, have fallen into comparative neglect, because they are no longer of decided utility in diagnosis, but the greater number have derived new value from their connection with the physical signs.

As the diagnostic characters of the diseases of the chest are composed of several distinct sets of symptoms, they may be studied after each class of them has been separately learned, or the diseases themselves may be first observed, and the symptoms analysed as they present themselves at the bed-side. The former method is naturally adopted in a systematic treatise, or course of lectures; the latter belongs more properly to clinical or demonstrative medicine,—a subject of which I treat more at large in another place. As the object of the present treatise is not only to explain the mode of application of these methods of investigation to the study of disease, but to teach the methods themselves, it resolves itself naturally into two parts. The first part will contain the explanation of the physical signs, and teach the method of acquiring them which I have found most convenient for the pupil. In connection with this portion of the subject, I shall treat of those functional symptoms which are immediately connected with the organs of the thorax, and are therefore most conveniently learned at an early part of the study. The second part will be devoted to the examination of individual diseases in connection with their symptoms and treatment. The series will thus comprise, as nearly as my time will permit, a complete history of the modes of exploration used in the diseases of the thorax, as well as an account of those diseases themselves.

The difficulties which attend the study of pectoral diseases, depend more, however, upon an imperfect method, than upon the subject itself, and may be obviated in a great degree by adopting an order which is in harmony with the natural connection of these signs. In all essential particulars they are readily understood when they are pointed out by one who is practically familiar with them; but one who is yet unpractised becomes embarrassed when he examines a patient without the aid of an adviser. Signs which are really different are sometimes confounded together, and those which are mere varieties

of the same species are thought to be perfectly distinct. If the signs are well characterized sounds, their discrimination should always be easy, and error would be impossible. That is, the correspondence between the sounds in certain physical conditions is necessarily exact, and the chances of error depend upon an erroneous interpretation of them. The interpretation is very different from the recognition of the sounds, and necessarily includes more data and more complicated reasoning. There can be no reason for not detecting a sound connected with the chest, it should be at least as easily recognised as the tone of voice or spoken language; it does not require any peculiar nicety of organs, or a finely cultivated musical ear, but merely a good power of discriminating sounds, and the attention necessary for observation of any natural phenomena.

I shall endeavour to arrange the physical signs in such an order as will facilitate this part of the study, and shall explain the method of acquiring them which will be found most convenient. The great secret is to give much attention to the signs at first, and fix each one in our mind as we go on. If we content ourselves with detecting them when pointed out to us, and merely understanding the differential characters without actually knowing them, we will gain but little, and we will never acquire the knowledge of them which is practically useful. The best method of avoiding the habit of careless observation, is to dwell long upon each sign at first, and afterwards connect it with others which are closely related to it, and are met with either in the same or in other patients. The whole matter will in this way be rendered singularly easy.

CHAPTER II.

CONFORMATION OF CHEST—CIRCUMSTANCES INFLUENCING IT—MODE OF EXAMINATION—MENSURATION—SUCCUSSION.

It was my object in the first chapter to prevent a frequent source of error, which often produces either an obvious or a concealed influence upon the mind. This is a desire to lay too much stress upon a single set of symptoms, to the neglect of others, and to examine a disease of a part of the body as if it were nearly or altogether unconnected with the same, or with different disorders which attack other organs and tissues. In commencing, therefore, a course of studies which are founded upon the positive evidence of anatomical lesions, and of the corresponding physical signs, I would put the reader upon his guard against too anatomical a view of the subject, too exclusive a study of lesions, and would warn him against allowing the results of disease to be confounded with disease itself; or the physical signs which constitute the key to so many important researches, from being mistaken for actual diagnosis. It is the deductions from the whole of the physical signs and functional symptoms, which constitute the diagnosis; not the naked examination of a single set of them. This may seem a matter which is too trivial to attract much notice; but in practice it is of much moment, and the errors which I have seen from a neglect of it are frequent, and very readily committed. It may seem that this is reasoning against myself, as it were, and attacking the subject upon which I lay so much stress; but, in professing to give an essay on diagnosis and treatment, imperfect as it is, I am necessarily led to an enlarged study of pathology, and to the view of the subject which seems to me most consistent with facts,—that is, one embracing the relation of the phenomena one to another. I am also unwilling to diminish the value of positive observa-

tion, by drawing any inferences which the actual state of the subject will not fully warrant; this would be the case, if, at the commencement of our studies, we fall into a contracted, imperfect mode of reasoning.

After giving this warning against the abuse of the physical signs, I may proceed to point out the best method of avoiding or overcoming the difficulties which we meet with, at the commencement of our studies. They depend in a great degree upon the difficulty of finding fixed starting points, from which the study of the subject may begin.

If we could acquire distinct ideas of the sounds of the chest from description, the difficulty would in a great degree cease, but this requires much care and attention, but by a little effort on the part of a physician who is interested in the subject, we believe that most of the difficulties may be obviated. To aid him, it is, therefore, necessary to explain fully the best mode of learning the sounds,—that is, of acquiring a sufficient number of sounds to serve as a point of departure, and guide for subsequent study. This method supposes that the sounds are analysed and separated into their elements, and requires at first more than an ordinary share of attention: but the whole time required for learning the art is much shortened, and the subject greatly simplified.

Most of these initial sounds may be discovered in the healthy body,—that is, sounds sufficiently similar to those we meet with in disease, to enable us to recognise them when they are heard; and if these are thoroughly learned, the remaining sounds, which are the most easy, are quickly acquired. We will find it to our advantage therefore, to follow very nearly the process which I shall point out, for the purpose of simplifying those sounds; for although it is not indispensably necessary for us, it is highly useful, and really will shorten the time and attention required in their study.

In studying the physical signs, I follow as nearly as possible the most natural method, reserving to myself, however, the privilege of deviating from it as often as may be advisable.

The physical signs, properly speaking, may be classed under the heads of alteration in the conformation of the thorax, and of

the resonance of the chest on percussion, and the sounds yielded by respiration, or produced during the act of coughing or speaking. These constitute the signs which may be regarded as strictly physical. There are some other signs, which, although less important, are, to a certain extent, classed among the physical signs; they belong more properly to the conformation of the thorax, than to any other division: under this head I shall treat of them. These are, succussion, or giving to the patient a sudden shake, to ascertain the presence of air and liquid in the cavity of the pleura, which is rarely practised, and is, in the majority of cases, both totally unnecessary and highly disagreeable to the patient; palpitation, or examining the chest by placing the hands upon it, and pressing them carefully along the lateral portions of it.

CONFORMATION OF THE THORAX.

The thorax, it is well known, resembles an irregular truncated cone. It is flattened on each side, and presents numerous inequalities, depressed in one part, and elevated in another. For the convenience of study, it is usual to examine it anteriorly, posteriorly, and laterally. Of these surfaces, the lateral, or the axillary, are the most regular,—the posterior, the least so. The walls of the thorax do not represent precisely the space occupied by the lungs and heart; for the liver, spleen, and stomach, encroach slightly upon the lower part of the cavity. This is particularly the case with the liver, which rises on the posterior part of the right side of the chest, nearly half an inch higher than the corresponding boundary on the left side. On the whole, the lower boundary of the right side may be represented by a line drawn from the spinous process of the twelfth dorsal vertebra, to the lower bone of the sternum: on the left side, the boundary begins also at the twelfth dorsal vertebra, but passes at a distance of half, or at least one-third of an inch higher, until it reaches the præcordial region. The lower boundary of the chest, as thus defined, is not always the same, as the size of the liver is of course variable, and the dimensions of the thorax are necessarily influenced by this circumstance. This line is not followed with

perfect regularity, especially on the left side where the heart passes a little beyond the limit of the adjoining part of the chest. At the upper boundary, the difference of the two sides is less; on the right it sometimes rises a little higher than upon the left, from the greater development of the muscles and bony parietes of the thorax on that side; but this difference is, in general, so slightly marked, as scarcely to attract attention. The lungs extend a little beyond the clavicles, especially during the act of full inspiration, but to a distance not exceeding half an inch. At the posterior part of the chest, the upper boundary is formed by a line drawn from the upper dorsal vertebra, outwards and downwards towards the point of the shoulder.

When the conformation of the thorax is perfectly normal, it presents an irregular plane on each of its four sides; but the angles of these planes are sufficiently rounded to retain a general conoidal shape. Each side of it offers several elevations and depressions; at the anterior part these correspond with peculiarities of form of the viscera, and are really formed by the parietes of the chest; but the irregularities of form at the posterior surface are owing, in great part, to the muscles, to the spine, and to the scapulæ. The clavicles form a ridge, which is slightly arched; the space above them is therefore depressed, except the patient be extremely corpulent, or labour under certain diseases of the lung or pleura. Beneath the clavicle, another depression, but one much shallower, exists; it extends to the lower part of the second rib. The space below this depression is slightly and regularly convex as far as the upper edge of the liver; at that level there is, in many persons, on the right side, a slightly depressed line, which corresponds with the interval between the liver and the lungs. On the left side in young persons, there is often a prominence corresponding to the heart; this is slightly marked, and never decided, as it is in cases of real disease of this organ, or effusions within its investing membrane.

The lateral portions of the chest are regularly bulging from the apex to the base; and as the walls are here thinner than elsewhere, and nearly without muscles, the external form corresponds nearly to the lungs.

The posterior surface is rendered irregular by the scapulæ; but at the part uncovered by these bones its form is nearly as regular as that of the other portions, gradually widening towards the base of the chest. A slight depression, or gutter, exists on each side of the spine, for the reception of the dorsal muscles. The lower and posterior portions are often dilated from effusion into the pleura, and yield to the pressure of liquid from within with great readiness. The upper part is not changed in conformation, except the quantity of liquid be very large. The contraction of the chest is also extremely obvious at the lower portion after the absorption of pleuritic effusions.

In children the form of the chest is much more rounded than in adults; and in women, although the exterior seems more irregular than in males, yet the proper bony parietes are much more regularly formed, and are more conoidal in shape.

The conformation of the chest, it is well known, is often characterized by individual peculiarities. Thus, some individuals are called chicken-breasted, from the prominence of the sternum, and others present a well-marked depression at the lower portion of this bone, which is sometimes congenital, and at other times is caused by trades or occupations which oblige the followers of them to work in a constrained posture, leaning forwards; this is particularly the case with shoemakers, who nearly all present this depression after working at their trade for a few years. Other individuals who are thin, and of a feeble constitution, offer a remarkable contraction of the parietes of the chest; but in all these cases, the contraction is more or less general, instead of being confined to a single part of the chest. When it depends upon disease it is much more local, and is caused in nearly every instance by pleuritic adhesions, which draw the walls of the chest towards the lungs. Enlargement of the chest, beyond the natural average, is nearly as frequent as contraction. When it coincides with a general development of the body, and evidently depends upon a stout and large frame, it is of course indicative of health, rather than disease. The morbid dilatations, properly so called, are local, either limited to a part, or to the whole of one side of the chest; on this account they are readily recognised. They depend either

upon an anormal development of the internal organs, or upon dilatations caused by effusions of air or liquid into the serous cavities of the chest. The comparison of the two sides is requisite, in order to recognise dilatations or contractions of the chest: and the thorax must be examined throughout in nearly every position, so that its true and relative dimensions may be ascertained.

It is not necessary that the chest should be exposed in order to examine its conformation, although this is much more convenient than to inspect it when covered. When no objection exists to exposing the chest, the patient should be placed in a sitting posture, or remain erect; if that be impossible, he should lie upon his back, and quite straight, so that the light may fall upon his chest; a cross light may of course give rise to error. The patient should then remain at rest, with his arms lying quietly by his sides or slightly crossed, if the posterior part of his chest be examined: in this way the whole of the anterior or posterior surface may be taken in at a glance. An examination of this kind is, of course, not practicable, in cases of women, or of patients who are sweating profusely; under such circumstances, we must content ourselves with the partial inspection, which is practicable when the body is more or less covered by clothing, and we may aid in this examination by passing the hands lightly over the thorax. For in most cases this mode of examination is amply sufficient for the purpose, and is free from the disagreeable circumstances which attend the exposure of the person. The examination by the touch is especially convenient for the posterior and lateral parts of the chest, where the morbid dilatation is generally most considerable.

The examination by the touch is called palpation, but I do not think it at all necessary to multiply terms in the description of the methods of physical examination. Palpation, then, is nothing more than the examination of the chest by means of the touch, it aids the sight, and often may be substituted for it when the patient is too thickly covered. The hand forms, as it were, a kind of natural callipers, and will give very accurate results. If we examine the lateral and inferior portions of the chest, we may place the whole palmar surface of the hand upon it; if the

anterior and upper portions be examined, the fingers may be passed lightly over it. In this way we can detect any abrupt deviations from the natural conformation, but a general and moderate rise or depression can scarcely be detected except by the sight. If we cannot resort to this means of investigation, we must content ourselves with the other physical signs.

Dilatation of the chest is necessarily produced by all diseases which give rise to enlargement of the pulmonary vesicles, or to distension of the pleuræ. Those which act upon the pleuræ are inflammation—the products of which are serum, lymph, and purulent matter;—or dropsy, in which the secreted fluid consists merely of serum. The effusions arising from pleurisy are nearly always confined to one side of the chest, take place rapidly, and are much more local than those of hydrothorax, which extend over a large surface, and are not confined to a single lung. Hence, the pleuritic distension begins chiefly at the base of the lung, and extends upwards, involving the whole of one side only in those cases in which the quantity is extremely great. Pericarditis gives rise to dilatation from the same cause as pleurisy, and the prominence follows very nearly the shape of the pericardium, and is therefore somewhat triangular, the small extremity pointing upwards. The extreme dilatation which takes place in severe cases of pleurisy, in which the whole side of the chest is enlarged, elevates the shoulder, and gives the whole body an inclination towards the healthy side. This is often evident when the patient walks or sits in the erect posture. The effusions of liquid into the serous membranes give rise to the most decided, and, as it were, abrupt prominence of the chest; while the dilatation produced by enlarged vesicles is, in general, less decided, or, at least, more gradual. It gives rise to a more equable and moderate bulging of the chest, than that from effusions of liquid into the serous cavities. Of course it is most marked near those parts of the lung where the vesicles are most frequently dilated—that is, along the anterior portion of the chest, on each side of the sternum; but, if it involve a large portion of the lungs the shoulders are sometimes elevated, and the space above the clavicles becomes prominent, instead of offering a slight depression, as it does in the natural state.

Contraction of the thorax is a consequence of many diseases in which pleurisy has occurred, either as a primary or secondary lesion; but it is most marked in cases of primary pleurisy, especially where the quantity of effused liquid has been large. In the secondary pleurisy which follows or accompanies phthisis, contraction almost invariably takes place, and usually occurs near the summit of the lungs, so that the natural depressions, both above and below the clavicle, are exaggerated. Sometimes the depression reaches to the lower portions of the lung, as in ordinary pleurisy. The latter variety usually follows those cases of phthisical pleurisy which have commenced in the ordinary way, and in which the development of tubercles takes place rather late in the disease, after the inflammation has ceased, or at least has diminished. The general rule holds good, that contraction is evidence of previous pleurisy,—the exceptions are nearly all of a doubtful nature. In a few rare cases the tissue of the lung contracts from the partial or complete cicatrization of a cavity, perhaps from inflammation, although the attendant pleurisy may not be sufficiently extensive, or the adhesions strong enough to account for the depression. In these cases we are bound to admit that the pressure of the atmosphere has filled up the vacuum which would otherwise have been left. In the depression which follows pleurisy, it is true that the process is somewhat similar, as I shall show when speaking of this disease, but it is less strictly physical, and more dependent upon the contractile power of the adhesions. The absorption of the effused liquid in pericarditis does not give rise to a decided depression; it sometimes exists, but only in a slight degree.

These are the general indications derived from an examination of the form of the thorax, and they are distinct chiefly from the results which are derivable from the sight and touch. In a few cases the chest may be measured on the two sides, in order to estimate the difference in the semi-circumference more exactly; by passing a tape around the thorax, from the extremity of the spinous process of the vertebra, then marking the point corresponding to the middle of the sternum, and afterwards comparing together the two parts extending from the sternum to the spine.

The seventh or eighth dorsal vertebra is the most convenient for this purpose. The measurement which is thus obtained is, of course, correct; but it applies only to those cases in which the difference is very evident, unless the dilatation occurs at the left side. In the latter case the increased dimensions are readily perceived; for the right side is naturally larger than the left, and the difference is more or less according to the habits which the individual may have of exercising the right arm more than the left: a difference in favour of this side would therefore be comparatively of little moment, and mensuration is therefore of little value as a diagnostic sign.

There is another mode of exploration which is termed succussion; it belongs to this part of the subject as properly as to any other. I use the term merely to explain the method of performing it, not to advise the reader to resort to it. The method itself is sufficiently simple, and consists merely in placing the hands on the shoulders of the patient, and giving him a sudden jerking motion. If both air and liquid are contained in the cavity of the pleura, a gurgling, almost a splashing sound, is produced. There are other and better methods of investigation, which are sufficient to make the lesions which cause these sounds perfectly evident; so that we need not in any case resort to succussion.

CHAPTER III.

PERCUSSION—RATIONALE—MODE OF PERFORMING—PLEXIMETER —DIVISION OF CHEST INTO REGIONS—VALUE OF PERCUSSION.

We now come to a highly important part of the subject—this is, percussion, or the method of estimating the density of the viscera contained within the thorax, by tapping lightly upon its surface. The rationale of this is very simple: the lungs occupy the greater part of the thoracic cavity, and are filled with air. If percussion be made upon them when removed from the body, they yield a very clear sound, especially if a solid yet elastic substance be laid upon them, so that it may receive the impulsion of the striking body, and prevent it from sinking into the soft pulmonary tissue: this elastic body, or sounding-board, exists naturally in the thorax, and is formed by ribs and cartilages; and a light tap upon their surface, that is, on the exterior of the chest, gives a clear, full, hollow sound. When the patient is thin, and the skin is very sensitive, he will not bear a smart tap without inconvenience; and, on the other hand, if he be very corpulent, or if the subcutaneous cellular tissue be infiltrated with serum, the sound will be quite dull, and will not truly represent the condition of the internal organs. In order to prevent this chance of error to the observer, and of inconvenience to the patient, we place an additional elastic body between the chest and the end of our finger. This interposed body is called a pleximeter, and was invented by Dr. Piorry. Its only utility is to increase the body of sound, by giving more resonance to the elastic parietes of the thorax, and to prevent the direct impression of the fingers upon the chest of the patient. Though the ribs are an excellent natural pleximeter; they are too sensitive at times, and at others are rendered useless for physical exploration by the softer sub-cutaneous deposits. By applying

an artificial pleximeter we not only increase the resonance of the natural sounding-board, if we may so call it, but we bring it more fully into play, by compressing, and, as it were, thrusting out of the way the tissues which impede its vibrations, and then we gain the important advantage for ourselves and our patients of preventing pain, and in this way perhaps of increasing the disease. The only method of performing percussion which is now practised, is that by means of the pleximeter. It has so many advantages over immediate percussion, or the striking with the ends of the fingers directly upon the chest, that it is much better fitted for every purpose.

The pleximeters used are various; that is, those that may be used; for, practically, they are reduced nearly to the most natural pleximeter, that is, the forefinger of the left hand. But if we choose, we may make use of a piece of gum elastic, of ivory, or of metal. We take this in the fingers of the left hand, and hold it firmly upon the chest, afterwards percussing in the usual way with the right hand. If it be not applied firmly against the chest, a clacking sound is immediately produced by the air which is interposed between the instrument and the skin: this clack cannot be entirely obviated, for the tap upon the instrument will of course give rise to sound. If the material be very dense, the sound will be sharp and decided, and interfere a little with the pulmonary sound, that is, the resonance developed by the tissue of the lungs; for this reason there are some advantages attending the use of the gum elastic pleximeter, rather than an ivory or metallic one, which is harder, and of course gives rise to more sound. The elastic instrument was, I believe, first proposed by Dr. J. B. S. Jackson, of Boston, and is the most convenient. We can readily enough make one for ourselves, by taking a common piece of gum elastic of the flat kind, about a quarter or a third of an inch thick, and about two inches square, that is of a size convenient for holding in the fingers. The density of gum elastic is more nearly similar to that of the chest, than a harder material, which is an additional reason for its employment, as it contributes to give a clear, uncomplicated sound.

The gum elastic pleximeter is easily made, but we are provided with one which is much more simple, and which I always resort

to—it is the forefinger of the left hand. In thin persons, the finger is even more bony and more elastic than the ribs; but in those who are fatter, or whose hand is remarkably stout and covered with a thick skin, the finger loses its elasticity, and is not so well fitted for the office of plexímeter. Still, under ordinary circumstances, it is the best one which we can employ, and is superior to any of the ordinary artificial instruments, from its ready adaptation to different parts and irregularities in the chest. The finger may in this way be placed behind the clavicle or below it, and be brought very near the lung, which could not be done if the plexímeter were a broad and flat plate: any single limited spot may be examined in the same way with great ease. This natural plexímeter may be used in two ways: we may apply the dorsal or palmar surface upon the chest, and of course tap upon the reversed side; if we apply the palmar surface upon the chest, the dorsal side upon which the percussion is made is firm, and gives a sharp clear sound; it is much better, therefore, for the accurate appreciation of slight deviations from the natural standard. The palmar surface is occasionally more convenient, especially when it becomes necessary to apply the finger to the depression behind the clavicle,—it is of course better for this purpose, that the finger should be curved to fit this depression; hence, percussion must be made upon the palmar surface. Much of this nicety in the mode of applying the finger which serves as a plexímeter, will be found to be unnecessary, and may be dispensed with after a little practice; the shape of the hand and fingers of the observer will, however, have some influence on the position which will be found in practice most convenient.

The most difficult part of percussion is not, however, the application of the hand which serves as a plexímeter; this is very soon acquired. Much difficulty, however, is often met with as to the method of tapping or striking with the right hand upon the plexímeter finger. We may use for this purpose either one finger or several, but you will find that for children, and for persons who are very thin, and whose chests are therefore quite sensitive, a single finger will be most convenient. Whether we use one or more fingers, the essential part of the process is to hold the hand as firm as possible, and to give the greatest possible elasticity to

the wrist. The motion should therefore be performed at the wrist, and not at the shoulder or elbow; if we strike with the whole arm, however gently it may be, we are apt to give the patient pain, and we are sure to deaden the sound. The sound depends mainly upon the elasticity of the wrist, and if the fingers be suffered to remain in contact with the pleximeter, or the thorax, a moment longer than is necessary for the percussion, the sound will be proportionately obscured.

The slowness of the motion with which the tap is given is a frequent error with those who are slightly acquainted with physical exploration. They are apt to pause as soon as the finger touches the surface, and allow it to remain in contact with the part; this is altogether wrong. It is at first difficult to acquire the perfect freedom of motion which is essential to elastic, clear percussion; still, it is perfectly practicable, with a little perseverance and experience.

There are some persons, however, who never acquire much readiness with percussion, however long they may attend to the subject; the difficulty is in the form of their hand, which is too stiff or the fingers too thick, to allow them to be readily bent and quickly struck upon the chest. They should therefore content themselves mainly with auscultation, trusting but very little to the signs of percussion.

If we use a single finger for purposes of percussion, there is little difficulty in holding it in the proper position. Either the fore or the middle finger of the right hand may be selected as the percussor; we then bring it, as nearly as possible, into the form of a light mallet or hammer, and make the second and third phalanges serve as the head of the hammer; of course, they must be flexed at right angles with the first phalanx, and must be retained firmly in that position, otherwise the form of the hammer is lost. The extremity of the finger should be as nearly at right angles with the hand as possible, otherwise the tap is not made with the extremity of the fingers, but the pulp, which is a matter of essential consequence, as the pulp of the fingers is soft, and non-elastic, and deadens the sound. If the thorax be covered with fat, or the parietes be infiltrated, it is necessary to percuss more strongly than is possible with a single

finger; in that case we bring the three middle fingers of the hand together, and allow them to rebound together after striking upon the pleximeter, they thus give a more forcible impulsion, and a sound nearly as clear as if a single finger were used. Indeed, we shall generally find this method the most convenient for the examination of the chest, although, as I have already stated, a single finger is the best percussor in cases of children whose chests are thin and very elastic, or those in whom the thorax is very nearly in the condition of that of children, from great emaciation. Although when we use several fingers, our tap is of course stronger than if a single one be employed, we shall find in either case that it is not the force, but the sharpness and quickness of the impulsion, which produces the sound. A hard blow causes so much clacking sound against the finger that it proves a source of error, and renders the full resonance of the chest more difficult to draw out.

Plain and easy as these directions are, probably no one will at first practise them correctly; we shall find that the elasticity of wrist, and light, clear tap, are learned but slowly, and after many efforts. There is, however, an easy method of improving our knowledge of percussion: we must repeat the operation frequently upon ourselves, at night, when we have removed our outer clothing, and all is quiet around us, a slight difference in sound then becomes perceptible, and the causes which render it dull are evident, and we thus learn to avoid those errors which are the more embarrassing from their apparent trifling insignificance. Notwithstanding all the care we may take, we will not make equal progress in this matter; to acquire a perfect facility, a light and rather thin hand, and a correct ear, are requisite; if we have not these advantages, we of course experience more difficulty,—but with increased practice and more attention, it may be overcome.

An instrument has been contrived by Dr. Bigelow, of Boston, for percussion. It is a piece of whalebone or elastic wood, covered at the end with a ball of velvet or buckskin; the ball is nearly an inch in diameter: it is a very good instrument if any accident should deprive us of the full use of our fingers: the objections to it are, of course, the trouble and complexity of its use; hence

Dr. Bigelow himself advises it merely in hospital practice, where we have a large number of patients to examine, and our fingers sometimes suffer from constant tapping. If we use this instrument, we tap with the ball upon the pleximeter, which should be made of gum elastic.

While I was at Paris, some years since, an ingenious friend of mine imagined an instrument for measuring the sound of percussion. It was to consist of a percussor somewhat similar to that of Dr. Bigelow, but enclosed in a large stethoscope. The percussor was to be set in motion by a spring and wheel, as in watches, and the ear to be applied to the stethoscope in the usual way during the action of the instrument. The idea was ingenious, but the practical application of it almost impossible. Any contrivance to assist the senses in diagnosis must be extremely simple, or it will be practically useless; and, as a general rule, we do much better to trust to our hands alone for the percussion of the chest.

Percussion is applicable to the study of abdominal as well as thoracic diseases; indeed, it is largely applicable to the exploration of many diseases of the viscera of both cavities. The abdomen contains solid viscera, such as the spleen and liver, and tubes filled with gas or liquid. The gaseous contents are much more abundant than the liquid; hence the sound of percussion is clear over the greater part of the abdomen from the gas retained in the alimentary canal. If the quantity of gas be increased, we necessarily have an increased resonance on percussion, and the converse is, of course, true; this fact enables us to estimate the effusion of liquid in the peritoneum, the enlargement of the solid viscera, and the distension of the cavity of the intestine with a large quantity of gas, which causes a tympanitic resonance. The same manual method of percussion is applicable here as in the exploration of the thorax; but, in general, we shall find that a very light tap, with a single finger, is the best, especially in those cases in which the gas is contained in the larger intestines, and therefore approaches very near to the surface.

Percussion of the abdomen is always practised when the patient is lying upon his back, and the surface of the abdomen is therefore placed in the situation most convenient for examination;

but in the thorax we vary the position,—that is, we vary it in all those cases in which the patient is well enough to change his posture at pleasure: if he be too feeble for this, we must of course, examine him in any way that happens to be practicable. In ordinary percussion, our object is to place the patient in such a position that we may render the parietes of the chest as tense, and consequently as elastic as possible; the muscles must therefore be put upon the stretch, and the skin drawn tightly backwards. In percussing the anterior part of the chest, the patient should sit upon a chair; or, which is still better, he may stand erect, and throw the shoulders slightly backwards, so as to render the pectoral muscles tense. For the posterior part of the chest the position should be reversed; the patient must lean forward, and cross his arms strongly, to draw the scapulæ from the spine, and throw out the arch of the back. To examine the axillary region, the arms should be raised above the head. The chest may be percussed at first in a cursory way on each side, to gain a general idea of the condition of the viscera, and afterwards we may proceed to the details, and compare the sonorousness of different parts of the lungs and of the heart. The lungs are not equally sonorous throughout their whole extent; for as the clearness of the sound depends upon the large quantity of air contained in the vesicles, and the small quantity of solid matter, a difference in the relative proportions of these parts will give rise to various degrees of resonance; thus, the sound is most clear wherever the vesicles are most numerous, and the larger bronchial tubes, whose walls are thick and firm, are least developed; for the thin parietes of the vesicles present no obstruction to the vibration of the air contained within them, but the hard walls of the bronchial tubes offer a very decided obstacle. Hence, if other things be equal, the sound may be stated to be most clear at the lower part of the chest, and along the anterior margin of the lungs, while it is comparatively dull at the summit and root; in the rest of the lungs the sound is intermediate, neither dull nor clear. Where the lungs are so situated as to overlap the more solid portions of viscera contained in the chest, the sound is but moderately clear, becoming more dull as the thickness of the solid organ is greater than that of the lungs. This is the case both with the liver and

heart, and is a fact which is analogous to the phenomena observed in a diseased state of the lungs, where a lesion which renders the deeply-seated parts of the pulmonary tissue more solid, makes the percussion dull over the corresponding parts of the lung. The dulness of sound is observed, notwithstanding the superficial portions of the chest, in which the lungs are placed, may be perfectly pervious to the air.

The relative quantity of bronchial and vesicular tissue gives rise to the modifications in the clearness of the sound in percussion to which I have alluded, and the resonance of the vesicular structure is quite different from that which would be caused by the same quantity of air contained in a single bag, or large vesicle. If the air contained in a large number of scattered vesicles were collected together, and percussion were made upon the sac which contains it, the sound would be drum-like, or tympanitic. This character is actually observed in certain morbid conditions of the chest, but it is never similar to the healthy sound, which is more deep and hollow, but at the same time less gaseous. The difference between the two varieties of the clear sound will be appreciated at once if we examine the chest, and then percuss downwards until we come to the hollow viscer[a] of the abdomen, which yield the tympanitic resonance very different from the hollow sound, which is caused by percussion on the lungs, and which is called vesicular.

After we have gained a general idea of the resonance of the chest, we should proceed to a more thorough examination of the various portions of it, one by one. For this purpose, it is convenient to divide the chest into regions or parts. These may be the anatomical divisions corresponding to the exterior of the chest; as the clavicular, scapular regions, &c.; or we may use terms expressive merely of the fractional parts into which the surface is divided, such as thirds, fourths, &c. For most purposes, the latter method has seemed to me to be the most convenient. When we wish to be more exact, we may subdivide these regions, or we may, in addition, designate them by a reference to their anatomical relations; but if we divide the anterior and posterior surfaces into three parts, and the axillary into two, it will be sufficiently minute for most purposes. The anterior surface may be

divided, therefore, first, into an upper third, extending from the summit of the lung to the lower margin of the second rib, and of course including the anatomical subdivisions of post-clavicular, or to the space above the clavicle; clavicular, that corresponding directly to this bone; and sub-clavicular, or the region found immediately beneath it. This portion, in general terms, may be said to correspond with the summit of the lung, and is of great interest to the physician; for it is the ordinary seat of tuberculous diseases, which of course render the sound dull; and occasionally of pneumonia, which produces the same effect in a more marked degree; and, thirdly, of emphysema, which renders the sound preternaturally clear. The middle third extends from the lower margin of the upper division to the space between the fourth and fifth ribs; it is less interesting for practical study, for its diseases are, for the most part, rather such as begin in the upper or in the lower third, and extend themselves to the middle, than those which commence in it. Emphysema, however, is often more developed about the middle of the lung than in any other part of this surface. The lower third extends from the boundary of the second to the lower margin of the chest; it is the usual seat of pleuritic effusions and of hydrothorax; in both of these diseases the liquid extends itself gradually from the posterior parts of the chest, towards its anterior margin, rendering the lower portion dull.

In the healthy condition the sounds of percussion are not equally sonorous in all parts of the anterior surface of the chest; in children the lower third is decidedly the most sonorous; in adults the middle is generally the clearest. In women we shall find it difficult to compare these various portions together, for the mammæ interfere so much with percussion, that it is extremely difficult to examine the middle third in a satisfactory way. The heart is another cause of dulness of sound at the internal part of the lower third on the left side. The præcordial dulness extends from the space between the fourth and fifth ribs at the sternum to the nipple, generally passing a little within this part. On the right the dulness is bounded by a line which follows the middle of the sternum; the lower part of the heart rests upon the diaphragm, and the percussion is therefore dull to the base of the thorax.

The axillary or middle surfaces are divided most conveniently into two portions by a line drawn transversely through the middle of the axillæ. The sound in these parts differs in a very slight degree, and is throughout extremely clear, from the almost complete absence of the more solid parts of the lungs, and the remarkable freedom of this portion of the chest from muscles which necessarily deaden the sound to a greater or less degree.

If the posterior part of the chest be divided into thirds, these portions are still more unequal in their resonance than they are at their anterior part. The upper third extends from the top of the lungs to a line passing along the spine of the scapula, prolonged to the vertebræ. This, like the summit of the lungs at its anterior part, is the common seat of tubercles, which are more frequently developed here than at any other portion. Percussion is, however, so difficult at this part of the lungs from the thickness of the muscles, that its results are not of great value to beginners. Under all circumstances the sound is but moderately clear, becoming duller towards the external margin. The middle third extends from the lower margin of the upper, to a line drawn at right angles to the spine from the lower angle of the scapula. The natural sound is here much more clear than in the upper third, especially near the spine, where the scapula does not interfere with it. Upon the scapula the percussion is necessarily dull. The lower third corresponds to the largest mass of pulmonary tissue; and from the conformation of the ribs, gives a remarkably clear sound in children, in whom the thorax is elastic. In adults, the greater firmness of the ribs and muscles, and the greater induration of the ligamentous and cartilaginous tissue, renders this sound less hollow; still it is always comparatively clear. This portion of the chest, with the middle third, is the usual seat of pneumonia; it is also the commencing point of pleuritic effusions,—hence, in diseases it is often dull, when the rest of the chest is comparatively clear.

After we have examined the chest in a cursory manner, the regions must be examined comparatively,—that is, each part should be compared with the corresponding one upon the opposite side at the same points. For purposes of convenience I generally begin at the summit of the lung, at the anterior part,

and then pass downwards towards the diaphragm, percussing both over the ribs and in the intercostal spaces, and always placing the finger of the left hand parallel to the ribs; this gives us the sound corresponding accurately with the portion of lung which is immediately beneath the finger, or very little more than the sound corresponding with that space. If we percuss across several ribs, the sound is more difficult to appreciate, as it is produced by a much larger portion of the lung, and is therefore of little value, except for the facility which it gives us of gaining a general idea of the condition of the lungs. If we are at all doubtful about the sound, I would advise that we should always compare the two sides together in very quick succession, while the impression of the sound is still fresh in our senses, and repeat the percussion until we are satisfied whether there is, or is not a real difference.

In a certain proportion of diseases of the lungs, the signs of percussion, united with the general symptoms, are sufficient for the diagnosis; and, if combined with the other physical signs, they are sometimes perfectly characteristic of the disease without the aid of the rational symptoms. We must remember, however, that percussion indicates merely the relative density of the lung, and is not sufficient for the diagnosis of most of its diseases without the aid of other means of investigation. But the signs of percussion, although comparatively few in number, are often of more value than any others, for their evidence is positive as far as it is applicable, and indicates with perfect accuracy the density of the tissue beneath the spot upon which the percussion is made; but as the causes which influence the density are numerous, they are not explicable without the comparison of other symptoms. Percussion is, therefore, of all the signs of pulmonary disease, the most strictly physical, and of course the most mathematically correct. Percussion is not confined to the diseases of the lungs; for as these organs surround the heart, the sound is clear as far as their tissue extends; hence the size of the heart is measured by percussion of the lungs, rather than of the organ itself. It is, as we shall afterwards see, one of the most certain methods of learning the size of the heart.

The practical mode of acquiring percussion is of more interest

to us than the mere detail of the signs derived from it. Like all the means of pectoral investigation, percussion may be learned in two ways,—that is either on the healthy or diseased subject. Those physicians who observe patients on a large scale, and have sufficient time to examine at their own leisure the cases which they meet with in practice, will learn percussion chiefly from patients and, as it were, in connection with other signs. But this is not always the more convenient method; it is not at all fitted for those whose sense of hearing is not acute, or who may not possess the necessary facilities for studying disease among a large collection of patients. If the ear is to be educated as well as the hand, we will cause no little uneasiness to our patients in attempts to gain, little by little, a familiarity with the sounds. We will be sure to percuss much too smartly for their comfort at least, and we may possibly aggravate the symptoms of their diseases. We should therefore always learn on our own persons; or several who are engaged in this study may unite together, and form little clubs for mutual percussion, so as to get on much more rapidly. For the healthy chest presents every shade of percussion, from complete flatness to the most perfect sonorousness, and we may thus accustom ourselves to every variety of sound. At first we should examine the parts of the chest where the sounds are most distinct; and for this purpose it is best to select a young person, and, if possible, one who is rather thin,—then by percussing first on the middle of the side of the chest near the sternum, and afterwards on the region of the liver, we may gain a correct idea of the difference between perfect flatness, and the full, clear, pulmonary sound. This should be repeated frequently, until a good idea of the difference of these sounds is impressed upon the memory, and above all, upon the senses. The same points of extreme flatness and sonorousness will explain the difference between the tapping with a single finger, and the deeper, but less sharp sound produced by decided percussion with several fingers. These comparative points should be examined on several individuals of different ages, and different degrees of flatness or thinness, until a correct idea of the average sounds is acquired. After the extreme degrees of sound have been repeatedly heard, the inter-

mediate characters may be learned by percussion of the præcordial region, where the sound is dull, but in the healthy subject not completely flat. There is also a little dulness of sound at the summit of the lungs; on the right side, in most individuals, it is a little less clear than upon the left. The repeated examination of these parts of the chest will not only give us a correct idea of the sounds themselves but will train our ear and hand to the manual performance of percussion.

I have pointed out the great accuracy of the signs of percussion, and their uniform dependence upon the same physical condition of the lungs. It matters but little whether the disease is seated on the surface of the lung or in the internal parts of it; the quantity of air is necessarily diminished by every hardening of the tissue, which is sufficiently extensive to compress one or more lobules. Whenever the obstruction is sufficient to form an alteration in the sound perceptible to our senses, it may be readily recognised. The induration is perceptible enough, when three or four lobules become impervious to the air, but it cannot be recognised with certainty, if limited to a less extent. The deeper seated lesions are rather more obscure than those nearer the surface, as the air-vesicles which intervene between the ear and the indurated portion, of course give rise to a clear sound, but it is less full and hollow than it is when the lung is completely free; for the plain reason that the mass of sonorous, that is, of aërated tissue, beneath the finger when we percuss, is less considerable.

A compression of the lung necessarily acts much in the same way as an induration of its parenchyma; hence effusions into the pleuræ, or even into the pericardium, compress the pulmonary tissue, and render it less elastic,—that is, they diminish the size, and expel the contents of the air-cells. The compression which is at first produced does not give rise to as great a degree of dulness as the induration of the pulmonary tissue, for the whole tissue remains pervious, and is merely a little less distended with air than usual; but in advanced cases of effusions into the pleura the flatness may be more complete than under any other circumstances, for the compression, although slow, may be carried to such a point as to alter the structure of

the pulmonary tissue completely, and flatten it against the spine. In the pericardial effusions the compression is never so great as to destroy the resonance, except immediately around the liquid.

Life has but little to do with the clearness or dulness on percussion,—for in the lung removed from the dead body we will find precisely the same condition of things under the same circumstances, and we may readily verify the fact for ourselves, if we attempt to make the examination of the body of an individual dead of a disease which alters the structure of the lung,—or we may resort to the same experiment, by producing a change in the structure of the lung by artificial means, such as injections of wax into the bronchial tubes, or of liquids or of air into the serous cavities, when the percussion is flat; if, on the other hand, we distend the vesicles by inflating them with air, the percussion immediately becomes extremely resonant.

We will find that in healthy individuals there is often a considerable difference in the sounds of percussion. I have already alluded to some of the causes of this difference, which may be perfectly external to the chest, and consist in accumulations of fat or serum beneath the skin; or, on the other hand, they may depend upon a want of resonance in the thoracic parietes, and arise from the partial ossification of the cartilages. There is a third class of patients who offer less than the average degree of resonance of the chest; in these individuals the lungs contain less air than usual, and are apparently more firm and more similar to cellular tissue. The chest, on the other hand, may be more resonant than the average, from either a real dilatation of the vesicles of the lungs, or from the patient being greatly emaciated without much disease of the lungs themselves. There is but one way of overcoming these difficulties,—and that is, to examine the chest in many patients until we acquire a knowledge of the average clearness or dulness of sound, and of the circumstances which modify it without the development of positive disease of the lungs. These accidental circumstances are altogether dependent upon ordinary acoustic principles: elasticity and thinness of the parietes of the chest favouring the clearness of sound, and thickness and rigidity of them producing a contrary effect.

CHAPTER IV.

AUSCULTATION—MODIFICATIONS OF RESPIRATION AND VOICE—BRONCHIAL RESPIRATION, CAVERNOUS, AMPHORIC, RUDE. SIGNS OF THE VOICE, PECTORILOQUY, BRONCHOPHONY.

We now come to the most important means of physical exploration,—that is, auscultation, or the act of hearing and interpreting the sounds produced in the chest either during the act of respiration, or of coughing or speaking, or caused by the action of the heart. Percussion teaches us merely the density of the tissue of the lungs; but auscultation goes much farther, and not only indicates the physical density of the tissue, but the functional play of the organs, and the obstructions which impede the passage of the air in the lungs, or of the blood in the heart. Hence the signs of auscultation are much more decided than those of percussion; they are developed by the patient himself, and of course cease with the termination of life. They are more complicated in their nature than the signs of percussion, and are less easily recognised, because they may be modified by a greater number of circumstances: but when these are taken into the account, the deductions from auscultation are quite as conclusive as those from percussion.

The mode of practising auscultation is extremely simple; we may apply our ear directly to the chest, or we may interpose between it and the thorax of the patient a solid or flexible tube; hence auscultation is said to be either immediate or mediate. That is, it is immediate when the ear is directly applied, but mediate when a tube is interposed between the ear and the chest. As the sounds are produced by the patient, and not by the hand at first, as in percussion, it is thus a very easy task; but it will be found of more difficulty when we arrive at the sounds themselves, and to their interpretation. Some, in themselves, are not

easily learned; but others are difficult, only because they differ one from another by slight shades, and may therefore readily be confounded together.

For most purposes, immediate auscultation, or the direct application of the ear to the chest, is preferable to the use of a conducting tube. Those who are perfectly habituated to the exploration of the chest, prefer this method in the great majority of cases, on account of its greater rapidity and facility of application, for there is no previous preparation necessary, nor is there any difficulty in passing the ear rapidly over the chest. But in those portions of the thorax, where the space for the application of the ear is extremely limited, such as the clavicular regions and the axillæ, or above the mammæ in females, the stethoscope, as the conducting tube is called, will be found preferable. Besides these reasons of mere expediency, the sounds themselves are sometimes better characterized, or at least better limited in immediate auscultation; this is the case with the heart, and even with the lungs; for, as the instrument covers but a small space, and is perfectly isolated from the rest of the chest, the sound which is produced near the limited portion covered by its extremity, is alone conducted to the ear,—and that coming from the adjoining parts of the thorax is not heard, or at least is so feebly heard that it does not materially interfere with the result. When we apply the ear, we place the large surface of the head in contact with the chest, and as the bones of the chest and head are tolerably good conductors of sound, we hear the sounds of a larger portion of the lung than is desirable, and acquire less precise notions. But when we wish to examine rapidly a large portion of the chest, we will gain much time from this very circumstance, and take in at once the sounds from a large space, such as a whole lobe of the lung, or nearly so; and if we are really familiar with the sounds, they can be analysed and distinguished one from another, though heard at the same time, just as several instruments can be recognised in the same piece of music played by a complete orchestra. For ordinary purposes, therefore, immediate auscultation is much to be preferred.

When we use an instrument for conducting the sound from the chest to the ear, we shall be obliged to take more precau-

tions. This instrument is called a stethoscope, and is nothing more nor less than a tube of light wood, such as cedar; the extremity which is to be applied to the chest, is hollowed into the form of a cone, the apex of which terminates in the tube, and, of course, it serves as an ear trumpet to conduct the sounds. The substance of the tube, although a comparatively good conductor of sound, is of much less service than the column of air; for an ordinary flexible ear-trumpet in which the sound is conducted exclusively by the column of air, is an excellent stethoscope. The diameter of the base of the cone should be from an inch to an inch and a quarter; if it be much larger, the sounds are confused, and the instrument loses its greatest advantage, that of concentrating the sound within a limited space; if too small, the sound is not loud enough. The essential point in the construction of a stethoscope is, that its cone should be deep and well hollowed out, at least an inch and a half or two inches deep, as is the case with all the good instruments now made. The cone should be perfectly simple, and not curved as was formerly the practice with many instrument makers. The length of the tube may vary from four or five inches to a foot; six or seven inches will be found to be of a very suitable length for most purposes. The diameter should not exceed a quarter of an inch, care must be taken to have it smooth and well polished throughout its whole length. The ear piece should be slightly convex or flat, or we may have a nipple-shaped projection, to insert into the ear; it should be of the same material as the rest of the tube, and not of ivory, as is often the case. For myself I prefer a tube with a perfectly smooth extremity, but there will be some difference of opinion as regards this matter, depending in part upon habit, and in part on the form of the ear. The ear should not be so near the chest as to expose you to the inconvenience of immediate auscultation, nor so far removed from it as greatly to diminish the intensity of the sound, for the sound becomes more gradually less and less loud in proportion as the ear is further removed from the part of the lung in which it is produced.

A flexible tube, that is an ordinary ear-trumpet, about eighteen inches long, with the open end brought nearly to the form of the extremity of the stethoscope, is, perhaps, the best instrument for

the examination of the sounds of the heart, as it does not conduct the impulse to the ear; hence the sounds alone are heard without the impulsion, which renders their analysis more difficult. Dr. Pennock of this city, who has devoted great attention to the diseases of the heart and their signs, was the first to introduce the flexible tube for this purpose, instead of the ordinary stethoscope.

I shall not enter further into the description of the mere instrument of hearing, which we may procure from any turner, but I must give some cautions respecting the mode of application of the stethoscope. If we apply it directly upon the chest we must take great care that the end be placed flat upon the skin, without inclining to one or the other side, as the sounds are both modified and lessened by the admission of air between the thorax and the tube. Indeed it is better not to place the instrument immediately upon the skin, but upon an under garment of muslin or flannel; this fills up the interstices between the tube and the surface, and prevents pain from too strong a pressure. This covering must be thin and not stiff, hence starched linen and silk are both improper, as they give rise to a rustling sound, and obscure the respiratory murmur.

When patients are much emaciated we can hear very distinctly the sounds of the chest through two garments, but under ordinary circumstances, it is best to auscult the patient clad only in flannel.

The position of the patient for auscultation should be similar to that already directed for percussion, but the muscles and skin need not be drawn as tensely upon the ribs, for the pressure of the ear or the stethoscope against the chest will supply the effort performed by the muscles, and bring the parts as closely together as is desirable.

The signs derived from auscultation are divided into those of the respiration, of the voice, of the cough, and lastly, of the heart. The signs of the respiration include both the modifications of the natural sounds produced by the disease, and the rhonchi, or the new sounds, which are totally unlike those heard in the normal state. The latter class of signs are simple, and readily learned; the former are more important, and are

produced by deeply seated alterations of the substance of the lung, producing a change in the density of its tissue. These signs are always attended with corresponding alterations in the percussion, and the resonance of the voice, which depend upon the same changes in the vesicular structure of the lungs, and in the condition of the bronchial tubes. They are thus learned, as it were, in connection; and the signs of the respiration are strengthened or disproven by the corresponding changes in the voice and the percussion. Hence we shall find it more easy to acquire them than it otherwise would be, for we may verify for ourselves at every step of the examination, and gradually acquire confidence in our powers of discrimination.

The morbid alterations of the respiration are well marked in extreme cases, but gradually pass into the characters of the healthy respiration; there is, therefore, but one way of learning these signs. It is first to acquire the signs when strongly characterized, and then to proceed to the cases in which the modifications of respiration are but slight. In the diseased subject we shall find that the strongly marked signs are very easily recognised; and many who follow practical demonstrations with sufficient attention, will naturally begin their study by the examination of patients who present these signs. Still, the facility for examining individuals in health is so much greater, that I should advise all beginners to familiarize and train their ear by the attentive study of those sounds presented by healthy individuals which approach most nearly to the signs of disease. And they will find that the characteristic marks of the radical sounds exist both in the healthy individual and in many diseased conditions.

These characters in healthy individuals are founded upon the peculiarities of the sounds in different parts of the chest dependent upon the differences in the tissue. The lungs consist of tubes conducting the air to vesicles in which the arterialisation of the blood takes place. The sound of the air entering the vesicles is different from that caused by its passage through the tubes; and the former is designated as the vesicular sound, the latter as the tubal or blowing sound. The vesicular sound is often called a murmur, from its softness and diffusion over a large space, and cannot be produced unless the vesicles are

healthy, or nearly so. If you keep up artificial respiration in an animal stunned by a blow on the head, or suddenly killed, and apply your stethoscope upon the exposed lung, the murmur is heard very distinctly during the inspiration, so that we have direct evidence that the sound is produced by the passage of the air into the vesicles; the vesicles, however, empty themselves in a noiseless manner, and the expiration is therefore nearly unheard. The tubal or blowing sound is quite different in its character; it is evidently produced by the passage of the air through tubes, and is heard very distinctly both in the inspiration and expiration,—and is, in fact, much more distinct in the latter. The cause of this difference seems to be the different manner in which the air impinges upon the vesicles and tubes. During the inspiration the terminating point is of course the air vesicles,—and the air, if forced into them with tolerable rapidity, produces a sound; this is the same, whether the impelling force be the pressure of the atmosphere, upon the column of air in the bronchial tubes, when the parietes of the chest are elevated by muscular action, or the force communicated by the bellows, when artificial respiration is carried on. The sound is in part owing to the vibration of the air, and in part to the noise produced by the dilating of the vesicles themselves. At least, the sudden dilatation of a partially collapsed vesicle is, in all probability, attended with sound, caused by the membranes; for, when the parietes of the vesicles are thickened, the sound probably becomes louder and more distinct. It is a point, however, which is difficult to decide, and one that is of little practical moment,—for, admitting either explanation, it is equally necessary that the vesicles should be clear, and that the air should pass freely into them from the adjoining tubes. The expiration produces a faint, vesicular sound; almost no sound in those portions of the lungs where the vesicular tissue is not traversed by bronchial tubes of a certain calibre. This probably depends upon the gradual manner in which the pressure upon the vesicles expels the air from them into the larger tubes through which it may readily pass towards the exterior: but as the air is forced out from the vesicles very slowly, and of course not in a regular stream or current, they contract without sound.

The vesicular murmur is compared to various sounds not very like to it; but it can be learned only in one way,—that is, by listening to those portions of the chest in which it exists in the greatest purity, especially towards the lower and lateral portions of the lungs. The murmur will be found to vary in intensity in different individuals: in some it is always feeble, and in others comparatively loud. It is louder in those persons of a nervous temperament in whom the necessity for rapid respiration is greatest, than in stouter individuals. It is also stronger in women and in children than in men and adults. The vesicular sound is indeed so much louder in children, that the term puerile respiration is used as synonymous with loud and full vesicular sound.

In most persons, the dilatation of the vesicles is obviously incomplete, except in forced inspirations, and in some is much more so than in others. This imperfect dilatation is rather more marked at the lower portions of the lungs than the upper, probably from the longer course and smaller size of the bronchial tubes, which require a more powerful effort to produce their full distension.

The tubal respiration is often called bronchial, from its production in the larger bronchial tubes,—or tracheal, from its development in the trachea,—the term tubal being thus always confined to the most intense degree of this sound. In the healthy individual this may be heard in a very marked degree at the trachea, immediately above the sternum, and the air is then heard very easily as it passes through it, both in the inspiration and expiration. The sound is always blowing, and very different from the vesicular murmur; this character is best marked in the expiration. The cause of this difference will be very obvious if we attend to the sound of our own respiration; we will find then, if we breathe rapidly, that the expiratory sound, which is heard out of the chest, is much louder than the inspiratory, and that it is produced in the upper portion of the bronchial tree, and in the nasal fossæ, where the air passages are large, and the rapidity of motion of the air is greatest. It is for this reason, in the trachea the respiration is most decidedly tubal, or if we choose to use the term, tracheal. It gradu-

ally becomes less and less so as we approach more nearly to the parts of the lungs where the vesicular structure is most abundant, and contains tubes of the smallest calibre, and furthest removed from the surface. We may thus analyse the different sounds heard in various parts of the respiratory passages; and it will then be found that the blowing sound is heard only at the trachea, and the vesicular only at the lower part of the chest—whilst at the roots of the lungs there is a mixture of the two varieties of sound, so that the vesicular is combined with the blowing sound. Passing from the root of the lung we will find a gradual diminution in the loudness of the bronchial sound,—but it is still heard as far as the summit, and much more distinctly on the right side than on the left. The difference in the two sides arises from their anatomical structure; for the tubes leading to the upper part of the right lung are shorter and larger than those going to the left, on which side the large bronchus passes under the aorta, and is therefore much longer and more tortuous than upon the right. The larger but shorter tubes of course approach much more nearly than the longer and smaller ones to the physical condition of the trachea, in which the air circulates with such freedom as to give rise to the loudest double blowing sound. The louder blowing sound exists on the right side, both at the anterior and posterior part; hence a given amount of induration of structure, which may tend to increase the loudness of this sign, will be much more perceptible on the right side than on the left,—while, on the other hand, in the state of health, a perfectly natural peculiarity may be mistaken for disease. The blowing sound, if it be heard only on the right side, must be well characterized to become a sign of disease, and when it is slight is not of much value unless combined with other corroborative evidence.

This difference of respiratory sound on the two sides of the chest dependent upon the different structure of the lungs, was not pointed out previously to some researches which I undertook upon the subject, at the Children's Hospital of Paris, about eight years ago. My attention was called to the subject by the observation made by my lamented friend Dr. James Jackson of Boston, who laid great stress upon the characters of the expira-

tion observable in commencing phthisis, and other diseases attended with consolidation of the lung. His remarks upon early development of the blowing expiration in commencing phthisis, were perfectly well founded; but at the commencement of his researches he was sometimes led into error from not making due allowance for the difference of the two sides dependent upon peculiarities of conformation.

In the study of the respiration we have a plain course to follow: we must examine as often as possible the region of the trachea, and then the lower and vesicular portion of the lungs, and thus fix in our minds the difference between the two leading varieties of the respiration, or the tubal and the vesicular. Some may find this study a matter of no little difficulty, while others can seize the distinctive characters at their first effort. They must not be in doubt as to the cause of this difficulty when it exists; it arises in part from a less acuteness of hearing, but much more from a defect of attention, which may be readily supplied by our own efforts; and, it must be admitted, that we know nothing of auscultation until we have mastered this subject. After the best marked sounds are learned, we may proceed to those parts of the chest in which we will hear the two varieties of the respiration at the same time; we then analyse their peculiarities, and may ask at each moment whether we have attained a clear idea of both sounds, as they are heard together. The same process should be repeated in different individuals of various ages, sex, and conformation; and we shall find that although they present numerous shades of difference, the radical features are the same, and must always be the same, for they depend on known principles of acoustics.

In connection with this part of our studies, we may properly enough accustom ourselves to the shades of difference offered by the parts of the lung, where other viscera, such as the heart and liver, occupy a portion of the space beneath the ear, and we may in this way learn the abrupt manner in which the respiration generally ceases at the lower margin of the lung. During our examination we should direct the patient to breathe with different degrees of rapidity, sometimes quite naturally, and at others, much more quickly, so as to force the air into the vesicles. In

the examination of diseased individuals nearly the same order is followed,—and after placing our ear for a moment upon the chest of the patient while breathing in a quiet and regular manner, we usually direct him to make a forced inspiration, which clears out the mucus in the bronchial tubes, and supplies a full proportion of air to each vesicle, or we direct him to cough, so that a forced inspiration may follow the expirations, which constitute the act of coughing.

In cases of disease of an acute character obstructing a portion of the lung, there is no necessity for directing the patients to breathe rapidly, as the obstruction in the diseased part of the lung causes the respiration in the rest of the pulmonary tissue to be much exaggerated or puerile.

After learning the radical characters of tracheal or bronchial respiration, which differ merely by a shade from those of the vesicular respiration, which is intermediate to the two leading varieties, we may proceed to the study of the morbid alterations of the respiratory sounds. These are classed according to their greater or less accordance with the natural characters of the respiration. They are the bronchial respiration, and its varieties, which include the cavernous and amphoric respiration. The bronchial respiration, as it occurs in a diseased lung, is essentially the same with the tracheal respiration of the healthy chest. The bronchial respiration is developed by causes which harden the parenchyma of the lungs, and destroy the vesicular texture: these are the infiltration of the tissue of the lungs with blood and plastic lymph in pneumonia, the compression of the lung by pleuritic effusions, and the deposits of various anomalous productions, such as tubercle and cancer, in the tissue of the lungs. If the induration be seated around the larger bronchial tubes, the bronchial respiration is generally much louder than in the portions of the lung where the tissue is chiefly composed of vesicles, for the essential cause of this sound is the passage of the air through the tubes. The induration of the substance of the lung merely developes the tubal or bronchial sound where it is not generally heard, or increases it in those parts of the lung in which it exists naturally. The bronchial respiration is produced then partly by the obliteration of the vesicles, and partly by the closure of the smaller

tubes. That is, the air in passing through the tubes of a certain size is suddenly interrupted and repelled from their sides, because their terminating branches are closed. This repulsion of the air produces sound and causes the blowing inspiration and expiration, which is heard most loudly when the air, instead of diffusing itself throughout the vesicular tissue, is, on the contrary, forced through the larger bronchi, which are converted into closed cylinders, from the occlusion of their branches by the progress of the disease.

The bronchial respiration is often accounted for in the following way:—The passage of the air in the tubes is, under ordinary circumstances, not attended with sound; as the surrounding tissue is a bad conducting medium, and deadens the sound. When this tissue is rendered more solid, the sound already produced in the tube, becomes audible, and is conducted to the ear. This explanation is valid only to a certain extent; the bronchial sound exists only in a slight degree in the natural state, for a tube through which the air is constantly and equally drawn during the respiration, gives rise to a very faint sound; but if the tubes passing into it be cut off, the passage of the air is at once hurried, and by its friction against the parietes of the bronchus gives rise to the usual bronchial sound. In disease, therefore, the blowing sound is sometimes much louder in those portions of the lung where it does not exist naturally, than over the trachea or the larger tubes, which are almost immediately beneath the ear; and this extreme loudness depends upon the circumstance to which I have already alluded,—that is, the sudden reflection of the column of air from the interrupted tube.

The large size of the tubes is, however, as I have already stated, a circumstance highly favourable to the development of bronchial respiration; and if the tubes be superficial, like the trachea the influence of size becomes more obvious. If the tubes be enlarged, while the parenchyma remains healthy, the respiration becomes bronchial, but to a less degree than if the tissue be hardened, and the tubes retain their usual calibre; for the induration is a more efficient cause of bronchial respiration than simple enlargement of the tubes.

The bronchial respiration is not perfect except when the indu-

ration of the pulmonary tissue is complete; this takes place in a few cases of phthisis, and in pleurisy with large deposit of lymph, but it is much more frequent in pneumonia than in any other disease, for in none other is the hardening of the tissue so perfect: this sign is therefore one of the best indications of the second stage of inflammation. In dilatation of the tubes the respiration becomes very bronchial when the surrounding tissue is indurated, that is, especially when it is complicated with pneumonia.

The bronchial respiration, then, is produced by the passage of the air through tubes of the middle and larger size in an indurated lung, and also by the enlargement of these tubes.

The cavernous respiration is another variety of sound which is closely analogous to the bronchial respiration, and depends upon the passage of the air into a cavity communicating with the bronchi. For physical purposes this cavity may be considered as a mere dilatation of the bronchus with which it communicates; but as the termination of the tubes themselves is never so abrupt as the morbid cavity, the air in the bronchial respiration proper is gradually diffused through the tissue, and is slowly lost to the ear,—but in the cavity it is abruptly reflected from the walls of the excavation, and therefore seems to be more circumscribed, and to come from a limited point. This diffusion of sound in the one case, and the concentration of it in the other, constitute the principal difference between these varieties of forms, and they therefore run into each other by insensible shades. As the line of distinction is an arbitrary one, it is sometimes impossible to discriminate between them; but it is not generally a matter of much practical moment, for the signs of a cavity generally become more and more distinct in proportion to the duration of the disease, and these which seemed doubtful, usually become clear in a short time.

The amphoric respiration is a modification of the same sound, but is more unlike the bronchial respiration. It is produced by the passage of the air into a large cavity with firm walls. If the communication between the cavity and bronchi be free, the expiration is also loud, and the signs differ from the cavernous respiration in one respect only—it is fuller and more musical,

somewhat similar to the sound caused by blowing into a glass or metallic vessel. Both the inspiration and expiration are blowing, and there is no trace of the vesicular murmur. If the communication with the bronchi be interrupted, or too small to allow of the free passage of the air, the inspiration alone is distinctly heard, as the air passes out of the cavity too slowly to produce much sound. The most common cause of amphoric respiration is a large tuberculous cavity near the surface, which is surrounded by indurated lung. It may also depend upon perforation of the pleura; in which case the amphoric tone is extremely well marked, as the cavity is much larger than one formed in the lungs, and its walls are large and elastic. If the amphoric respiration depends upon a gangrenous cavity, it generally renders the sound more obscure; so that it is less marked than in tuberculous excavations, as the surrounding tissue is usually soft, and is therefore a bad conductor of sound.

We now return to the bronchial respiration as our standard of comparison, and pass from it to the vesicular murmur, reversing the order we have just followed. The varieties of the respiration intermediate between the vesicular murmur and the true bronchial respiration, are very numerous; but they are properly enough classed under the general designation of rude, or rough respiration, which is applied to those varieties in which the vesicular murmur is still retained, but the blowing sound is at the same time more developed than is natural in the part of the lungs where it is heard. It may be attended with a feeble or an increased loudness of the vesicular murmur. When this is more feeble, the obstruction to the air occurs about the smaller tubes, and gradually compresses them; when loud, the morbid deposit is situated rather in the course of the larger tubes than at their terminating branches, which still receive their full supply of air while the respiration becomes blowing from the increased conducting power of the hardened tissue. The rude respiration is one of the most interesting varieties of the respiratory sound, for it occurs in those cases in which the lesion is not yet much advanced, and a portion of the pulmonary tissue remains permeable to the air; hence it is a sign of the earlier stages of phthisis, as well as of the commencement of pneumonia and of pleurisy. It is a sign which

can only be learned with some difficulty, because both the primitive sounds of the respiration are present, and they can only be separated by a careful analysis.

From the rude respiration we naturally return to the vesicular murmur; which may be exaggerated, or enfeebled, but still retain its essential characters. The exaggerated or puerile respiration, generally depends upon disease in other portions of the lungs than those in which it is heard. The healthy portions then perform double duty, and arterialize more than their proper share of blood. From the occurrence of puerile respiration in a part of the lung of a patient who labours under dyspnœa, we can very often determine that some obstruction must exist in other parts of the lungs; and from the knowledge of the acute and chronic diseases which generally give rise to this obstruction, we can with tolerable certainty discover the nature of the lesion. The respiration is rendered feeble in disease, either by the compression of the vesicles from effusion upon the exterior of the lung, or the development of solid matter in the parenchyma, or lastly, from obstruction of the smaller tubes.

There are some other varieties of the respiration, which it would be difficult to bring within a systematic description; they should be learned after the leading varieties have been first studied. They generally arise from slight changes in the condition of the vesicles or smaller tubes, and sometimes from the mode in which the respiration happens to be performed, but rarely depend upon important organic changes in the lung. They may be reduced to the following: 1st, the incomplete or interrupted respiration; in this variety the inspiratory sound seems to be arrested before the air passes completely into the vesicles; it arises from two causes,—a nervous spasm, and a partial thickening or congestion of the smaller tubes. It is a peculiarity which is often observed when we examine for the first time a nervous, sensitive patient, who is alarmed by the exploration of the chest; and it is sometimes met with in the infiltrated or congested state of the lungs which attends the forming stage of tuberculous disease, as well as certain varieties of bronchitis. 2. The rustling sound of the respiration is

one of the characteristics of emphysema, in which the vesicles dilate and contract with difficulty, and seem to produce sound rather from the rustling of the membrane, than from the passage of the air which strikes against it. There are other and slighter deviations from the natural tone of the respiratory murmur; but, although they are very obvious to an experienced ear, yet they are neither sufficiently permanent nor well marked to be reduced into a systematic classification.

OF THE VOICE.

The varieties of the respiratory sound correspond with varieties in the resonance of the voice, which often are nearly as well characterized; still, the natural tone of the voice has so much influence upon its aptness for vibration, that the signs are not always as perfectly distinctive as those of the respiration. In the ordinary act of speaking the voice vibrates throughout the chest: and if the hand be placed upon its parietes, a slight tremor is very perceptible; if we apply one ear to it, we will hear a thrilling, but distant and confused sound. This sound becomes louder, and is brought nearer to the ear, if we listen near the summit of the lungs, especially on the right side, or at their root; and placing the stethoscope upon the trachea we find the resonance loud, and the words pronounced nearly as distinctly as they are by the mouth. In fact, the voice is conducted by the column of air, so that articulated words seem to enter the ear from the trachea. This distinct and loud resonance at the trachea is almost exactly similar to pectoriloquy; and it is in this situation very perfect, especially if the voice of the individual be naturally clear, and rather shrill. At the sternum, and at the root of the lungs between the scapulæ, the resonance is less perfect, and the voice seems to enter the ear less completely than in pectoriloquy; it is therefore not quite so well characterized a sign, and is called, from its position, bronchophony. In the rest of the lung the resonance of the voice is gradually less and less loud as we pass from the bronchi to the vesicular structure, where we hear nothing but a faint vibration.

There is, therefore, a uniform relation between the voice and the respiration, the resonance of the voice being greatest when the blowing sound of respiration is most intense. In disease the same proportion exists; a cavity gives rise to cavernous respiration in breathing, and to pectoriloquy in speaking,—and a consolidated lung, especially around the large bronchi, produces bronchophony and bronchial respiration. The same relation exists between a mere loud resonance of the voice and rude respiration, and between the ordinary vesicular murmur, and a slight thrilling vibration of the voice. In cases in which the murmur is enfeebled, the resonance of the voice is less: but sometimes there is a low, purring sound, communicated to the ear as well as the hand, which is analogous to the rustling sound of emphysema, and depends upon the same causes. The blowing respiration may continue very loud when the resonance of the voice has become quite feeble, for an accumulation of mucus may be forced aside by full inspiration, but cannot be thrown out of the way by the act of speaking, and therefore obstructs the vibration of the column of air; in these cases it is not, however, totally destroyed, for the sound of the voice is conducted by the hardened lung from the neighbouring tubes.

When a cavity in the lungs is very large, there is, of course, amphoric respiration at the same time. On careful examination we then find amphoric resonance of the voice, which often scarcely differs from pectoriloquy; that is, if the cavity be not much larger than a hen's egg, and its walls remain firm. But if the cavity increase much beyond this size, the resonance of the voice is extremely metallic, or has a clear ringing sound, which, like the respiration, is very similar to that produced by speaking in a glass bottle without quite closing its mouth, at the same time the voice is less loud than in pectoriloquy, so that it is not unfrequently difficult to ascertain that it is really amphoric.

When the large cavity is situated in a soft permeable portion of the lung, the amphoric respiration may become very obscure, like the resonance of the voice under the same circumstances.

The bronchial respiration which results from pleuritic effu-

sions, is not very loud, but differs so slightly from the other varieties, that it is usually not separated from them while the resonance of the voice which takes place under the same circumstances, is very different. Its vibration is very great, and is so peculiar that the sound is called egophony, from the bleating tone of the voice, somewhat similar to that of a goat or sheep. This is not an invariable result of pleuritic effusions, but it is produced in almost all cases in which the effusion is sufficient to compress the lung without entirely flattening it out. If the quantity of liquid happens to be very great, but the lung is stiff and more solid than usual from previous inflammation of its substance, the egophony continues longer than it otherwise would do, and rarely ceases during the course of the disease.

Egophony is, however, in the large majority of cases a very transitory sign, ceasing generally in a few days after it has been heard. Sometimes the sign is only perceptible for a single day, disappearing as soon as the quantity of liquid is increased; for the sign is only perceptible when there is a moderate effusion. In other cases we do not recognise the sound at all, throughout the whole course of the disease. In a few individuals the voice is egophonic for a very long period; but these are quite exceptions and very rare cases. We generally hear egophony most distinctly when it is present, by listening when the patient speaks, near the lower margin of the scapulæ: that is about the upper portion of the effused liquid. The cause of this modification of the voice is very difficult to explain, it is somewhat like bronchophony, and probably arises very nearly from an analogous condition of the compressed lung to that which is found in cases of inflammation; that is, the lung is slightly indurated from the compression, and the air is afterwards thrown into a peculiar resonance by passing through the effused liquid.

The signs of the voice are learned by the same process as those of respiration. After having acquired a good general idea of the characters of the respiration, we should examine them in connection with the signs of the voice, confirming or disproving one by the other, and then practising percussion,

which will throw additional light upon the subject. We need not, of course, restrict ourselves to the healthy subject, but we would also study those cases of diseased lungs, in which the diagnosis is comparatively easy from the functional signs alone, such as examples of decided phthisis and pneumonia, and then search for cavernous and bronchial respiration, with the connected signs of the voice and percussion.

The cavernous resonance of the voice in pectoriloquy was the first physical sign discovered by Laennec. He happened to place some paper rolled up into the form of a cylinder upon the chest of a patient, in order to feel the pulsations of the heart, when he was surprised to find that, during the act of speaking, the voice of the patient seemed to enter his ear. He examined immediately the chest of a large number of patients in the same way, and detected the same phenomena in a great number who were evidently labouring under advanced phthisis; the cause of this was afterwards found to be cavities in the lung communicating with the bronchial tubes. Pectoriloquy was divided by him into three varieties—the perfect, the imperfect, and the doubtful: in the perfect, the voice seemed to pass through the stethoscope (which Laennec always used) to the ear, in the second to enter the tube, and in the third the resonance was quite confused. These distinctions are of little value, and rather tend to confuse our ideas.

The following table will give you the relation between the voice and the respiration:

Amphoric Respiration,	Amphoric Resonance of Voice,
Cavernous Respiration,	Pectoriloquy,
Bronchial Respiration,	Bronchophony,
Rude Respiration,	Strong Resonance of Voice,
Vesicular Respiration,	Slight Thrilling of Voice.

THE RHONCHI.

There are a number of sounds produced by the respiration in certain states of disease of the chest, which are totally unlike the sounds heard in health. These sounds are called the rhonchi;

and they are mainly produced by impediments to motion of the air in the bronchial tubes. Those which belong to the lungs proper are caused by obstacles to the passage of the air through the bronchial tubes; these are the most interesting and important of the class.

There is another set of sounds to which the term of rhonchi is sometimes applied, but which differ in some respects from them. They arise from the friction of the serous membranes in the chest, and are common to both the lungs and the heart. They occur when the effusions in these membranes consist chiefly of lymph which coats the surface of the serous tissues sufficiently to cause a slight creaking sound. This creaking or friction sound in the pleura, takes place during both inspiration and expiration; but especially at the commencement of the expiration, when the ribs first begin to sink down, and the pleura is drawn rather rapidly over them. It is not limited to a single spot, but shifts about with the dilatation and contraction of the chest; and is generally most evident about the lower angle of the scapula, and often extends from that point across the axilla to the sternum. It is a sign which is proper to pleurisy, either primary or secondary; and it is in general readily recognised after the bronchial rhonchi are known, especially if the friction be sufficient to give to the parietes of the chest a thrilling motion, which may be felt by the hand.

The rhonchi, properly so called, are divided into the moist and the dry. The moist rhonchi are the mucous, including the gurgling of cavities, the sub-crepitant, and the crepitant. The dry rhonchi are the sonorous and the sibilant, to which may be added the dry crepitant.

The *moist rhonchi* are caused by the resistance offered by a liquid in the tubes or vesicles, to the passage of the air; the liquid forms bubbles of various sizes, and their successive breaking is the chief cause of the rhonchus. The dry rhonchi are produced by real thickening or spasmodic contraction of the mucous membrane, which gives a musical tone to the respired air; they are most evident in the expiration, while the moist rhonchi are for the most part heard during the inspiration. The rhonchi are not necessarily permanent, except the crepitant rhon-

chus; for the obstructions forming mucous rhonchus, or the thickening of the larger tubes may be removed for a time, in many cases, by an effort of coughing.

The mucous rhonchus is the loudest of the moist rhonchi; it is caused by the breaking of bubbles of tolerable size contained in the larger tubes; the sound is readily enough recognised, and is scarcely ever mistaken, even on a first examination. This is the sound which is often audible at a little distance from the chest of the patient, especially if it extend over a large portion of the lungs. The mucous rhonchus is heard wherever there is an abundant secretion of liquid into the larger bronchi, and this generally arises from the second stage of bronchitis; it is also quite common in phthisis and the third stage of pneumonia; and the blood which is poured into the bronchi in hæmoptysis, may give rise to almost the same phenomena. The mucous rhonchus is generally heard both in the inspiration and expiration, that is when the air returns with sufficient force from the lungs to agitate the liquid, and form bubbles; as a general rule, however, it is heard chiefly during the inspiration.

There are two varieties of the mucous rhonchus, which are almost peculiar to phthisis; these are the dry crackling, produced by the softening of the thick, pasty matter of tubercle, which gives a peculiarly dry and sharp sound, and the loose, but concentrated gurgling of a cavity. Any disease which gives rise to a cavity in the substance of the lung will produce this cavernous gurgling; hence it may arise from gangrene of the lungs, pneumonia, or even a dilated bronchus. But as cavities depend much more frequently upon phthisis than any other cause, probably forty-nine out of fifty of those which you meet with, may be referred to softened tubercles. The gurgling differs from mucous rhonchus merely by its greater concentration; it is in this respect that, like the other signs of cavities, it is distinguished from those of the bronchi; and it passes into mucous rhonchus by an insensible gradation. We may place, therefore, the dividing line between the mucous rhonchus of small cavities, and of the bronchi, where we please. Large cavities can never be mistaken. But there are some cases of dilatation of the bronchial tubes which extend over a considerable portion

of the lung, in which the secretion of liquid is abundant, and the mucous rhonchus very similar to that of an ordinary tuberculous cavity. The liquid gurgling is heard both in the inspiration and expiration, for the air is reflected from the sides of the cavities during expiration, and of course causes an almost continuous rhonchus. You will find that both the crackling and gurgling are liable to disappear, although the cavity remains; for the liquid secretion may be for a time suspended, or the matter may be expectorated, and the walls of the cavity may for a time remain dry.

The sub-crepitant rhonchus differs from the mucous in two respects: the bubbles are finer, and they break in a more gradual and regular succession. The rhonchus is therefore confined to the smaller tubes, through which the air passes rather slowly, and the bubbles nearly fill up their calibre. It is heard in various parts of the lungs, but much more frequently at their lower and posterior part than elsewhere, for the liquid accumulates there in the smaller tubes more than in any other part. The sub-crepitant rhonchus is heard very faintly during the expiration.

The crepitant rhonchus is the most important of the moist rhonchi. It is either fine or coarse: the latter variety differing very slightly from the subcrepitant. When the crepitant rhonchus is fine, it is pathognomonic of the first stage of pneumonia; and it is then produced in the vesicles of the lung, and perhaps in the small tubes which ramify through the lobules,—but when it is extremely fine, the sound is probably strictly vesicular, and seems to depend upon two causes, the breaking of the minute bubbles of thick mucus, and the dilatation of the thickened and stiffened vesicles. If the crepitus be rather coarse, it seems to arise more from the smaller tubes than from the vesicles, although this is a point which is not susceptible of a rigorous demonstration. A crepitant rhonchus is a sign which is connected with the parenchyma of the lungs, and can never occur in the larger tubes; and it is not produced by other diseases of the parenchyma than pneumonia, because it is only in the latter disease that you will find the thick, viscid secretion, and the stiffened, yet still dilatable condition of the vesicles. The pure

crepitant rhonchus is strictly confined to the inspiration; the air does not pass in the expiration with sufficient rapidity to break the tenacious liquid. The crepitant rhonchus generally forms trains of bubbles, something like the successive explosion of a small train of wet powder; and the sound is compared to various trivial noises, such as the crackling of salt, and the rubbing of a lock of hair; but, like all the signs of auscultation, nothing out of the body gives a correct idea of its character. We, must, therefore, learn it in patients labouring under pneumonia; and if we have not opportunities for examining cases in connection with persons who are familiar with physical signs, I would advise those engaged in this study to select a case in which the pneumonia is advanced to the second degree, and the general symptoms of the disease accord with the physical signs. In such cases the diagnosis of the disease may be regarded as quite certain; and we may trace the crepitant rhonchus as it proceeds from the interior of the indurated lung towards the exterior, and is heard simultaneously with bronchial respiration.

There are certain sounds connected with the pleuræ which are similar in many respects, as I have already stated, to the moist rhonchi. These are two in number, the friction sound, and the metallic tinkling which is heard generally when the external air communicates with the cavity of the pleura, but is occasionally observed in cases of large cavities in the substance of the lung. The friction sound differs in some cases very slightly from the sub-crepitant, and I have sometimes been puzzled to discriminate between them; of course I do not allude to the well characterized variety, in which there is a thrilling motion extending along the chest, and felt as well as heard, but to those cases in which the friction is very slight. The deposit of lymph is then generally very small, but such is not necessarily the case, for there may be little friction when the effusion is large, especially if the lung be separated from the pleura by serum, which prevents the two surfaces from coming much into contact. The best method of distinguishing the slighter variety is to attend to the manner in which it follows the act of respiration; in the true sub-crepitous rhonchus the bubbles break regularly, and follow the passage of the air; in the slight friction

sound there is not this regularity, and its position is never as permanent; there are besides, generally, some collateral circumstances, such as the existence of the sub-crepitant rhonchus in other parts of the lungs, which will aid in distinguishing the two sounds.

The metallic tinkling is a peculiar sound produced by the escape of bubbles of air from beneath a stratum of liquid, situated in a cavity whose walls are firm and elastic. The liquid must occupy only a portion of the cavity, the upper part remaining filled with air. It was supposed that the sound was caused by a drop of liquid which fell from the upper surface of the fluid. Dr. Bigelow, of Boston, suggested the explanation which is now commonly received, that the sound is not caused by the fall of a drop, but by the bursting forth of a bubble of air from beneath the liquid. This is the case, but it is not necessary that the air should be driven forcibly through the bronchial tubes; a very small portion of air contained within the liquid is sufficient to give rise to the tinkling. The sound is called tinkling, because it is somewhat similar to the light tinkle produced by striking with a pin or some other light piece of metal upon a glass vessel. It is always heard in connection with the amphoric respiration, which depends upon the physical condition necessary to produce it. The sound, therefore, is not of great practical value.

The *dry rhonchi* are the sonorous, sibilant, and the dry or rustling crepitant; the latter of these is of very little value, and hardly differs from the rustling sound of the respiration, to which I have already alluded. They are, for the most part, heard chiefly during the expiration, and are caused by temporary or permanent thickening of portions of the mucous membrane of the larger or smaller tubes. In the large majority of cases they are heard in the earlier stages of bronchitis, before secretion has occurred, or in the chronic stages of this disease in which the secretion is not sufficient to remove the swelling of the membrane. But they may depend on a purely spasmodic state of the bronchial tubes, for there is no doubt that these tubes are occasionally subject to spasmodic action.

The sonorous rhonchus is generally very loud and well marked;

few can have ever heard it, without recognising it merely from description. It is a loud cooing sound, somewhat similar to that caused by drawing the bow slowly over the bass string of a violin, or to the cooing of pigeons. The sound may be compared most exactly to the note of the violin; but the rhonchus itself is so peculiar from its deep musical tone, and so unlike any other sound heard in the chest, that we can scarcely mistake it. It is most frequent along the upper part of the lungs, both anteriorly and posteriorly, and cannot be produced except in the larger bronchial tubes, for the smaller ones do not yield so deep a note. In acute bronchitis, and even in the chronic cases of this disease, this rhonchus is so fugitive that it sometimes ceases and returns almost with every act of respiration. But we can generally find it in some portion of the lungs, although it may not remain long in a single spot. It is, however, not always so moveable. In the numerous cases of secondary bronchitis which attend the diseases of the lungs and various acute disorders, the sonorous rhonchus is frequent, but it is not found in the most severe and dangerous cases of these disorders, or at least not exclusively. It is in all cases a sign of bronchitis, and when not connected with the moist rhonchi, generally indicates a mild form of the disorder.

The sibilant rhonchus bears the same relation to the smaller tubes, that the sonorous does to the larger; it is a low, whistling sound, heard principally, but in general, not exclusively during the expiration. Generally it is very short and variable in situation. Of course we may find it in those portions of the chest where the bronchi are rather small, and, at the same time, are not subject to congestion or accumulation of secretion,—that is, at the anterior margin of the lungs. The sibilant rhonchus is chiefly heard in the various stages of bronchitis without effusion, especially in the chronic dry catarrh, and in almost every case of the secondary bronchitis of typhoid fever.

Both these dry rhonchi are easily learned from this description alone, for they have a sufficiently close analogy to the sounds which are selected as objects of comparison. Thus, the deep bass note and the musical tone are quite characteristic of the sonorous rhonchus, while a whistling and slightly musical sound are

equally distinctive marks of the sibilant. The latter rhonchus is even more moveable than the sonorous, and is extremely irregular in its time of re-appearance.

The mucous, sub-crepitant, sonorous, and sibilant rhonchi are sometimes heard combined together in a variety of chronic catarrh, attended with asthmatic paroxysms; they were then sometimes called by Laennec the "song of all birds,—cantus omnium avium." More frequently, however, we may find two at least of these rhonchi present at the same time, as the sonorous and sibilant, the mucous and the sub-crepitant; a dry may be combined with a moist rhonchus. This depends upon an obvious cause; the various portions of the mucous membrane may be affected to different degrees, and in one part secretion may have commenced, while another remains turgid and dry; besides the secretions tend to accumulate at the posterior and inferior part of the lungs; hence we find the moist rhonchi sometimes in this position, when the same inflammation gives rise merely to a dry rhonchus elsewhere. The rhonchi may also be connected with other physical signs, as the bronchial respiration and resonance of the voice; and it is sometimes a matter of some difficulty to distinguish them. This is especially the case with the bronchial respiration and the sonorous rhonchus; one not accustomed to these signs may easily mistake one for the other when they occur singly; and if combined, the sonorous rhonchus may mask the bronchial respiration to an inexperienced observer, for both these signs are chiefly heard during their expiration, and there is a certain degree of similarity between them. The only certain distinguishing mark when there is a difficulty is to examine the part of the chest by percussion; if this be flat it will prove that there is bronchial respiration wherever the tubes are large; if both bronchial respiration and sonorous rhonchus are present at the same time, the flat percussion is so far useful that it indicates the more important sign. The chances of error, therefore, become extremely small, and are still more diminished if we attend to the musical tone which attends the sonorous rhonchus; this does not characterize the bronchial respiration, which is a pure blowing sound.

After having gone through the description of these sounds the reader may be tempted to make the same remark which has

often been repeated to me. That is, that the difficulty is not in understanding the description of the sounds, but in acquiring the habit of rapidly and readily recognising them. To be practically useful we must distinguish them with certainty, and we must do this without great loss of time to ourselves, or the fatigue to our patient which necessarily results from a protracted examination. If an inexperienced physician should be tempted to lay too much stress upon his newly-acquired knowledge, he may perhaps be induced to fall into the errors against which I have warned the reader at the beginning of this treatise, that is, of trusting too much to physical diagnosis.

Now, we must avoid both these errors, and we do this by the same means; that is, by making our diagnosis by the general symptoms, and merely adding the physical examination to this as a matter of instruction, until we are sure of our own progress. The caution is designed for those who trust chiefly to their unaided exertions; these are, under ordinary circumstances, sufficient, though necessarily attended with more trouble, and requiring more time. I shall bear these remarks in mind when describing individual diseases, and will group the physical and general signs together, that one may mutually assist the other.

The rhonchi, as well as the other sounds of the lungs, are heard without difficulty in most cases; but sometimes when the lungs are not much diseased, or when the bronchial tubes are partially obstructed, it is necessary for the patient to breathe with a certain effort. It is right, therefore, if we are not perfectly satisfied with the auscultation of the respiration, to tell the patient to breathe quickly, so that the air may be driven rather forcibly into the vesicles, and the sounds may thus be well developed.

There are another set of symptoms which are not physical, yet are so local in their character that they should be described before you proceed to the study of special diseases; these are the cough and expectoration, which may properly form the subject of another chapter.

CHAPTER VI.

COUGH, EXPECTORATION.

Cough is produced in diseases of the thorax from two causes—the accumulation of liquid in the bronchial tubes, and the sympathetic irritation caused in the larynx by pain or stricture in the chest. In the former variety the cough is useful, and is productive of relief to the patient: in the latter it is often a cause of aggravation of the symptoms. The true excretory cough occurs only in the diseases of the bronchial mucous membrane, and of the parenchyma of the lungs which directly communicates with this membrane. The irritative cough takes place not only in the earlier stages of inflammation of the bronchial tubes, and of disorders of the parenchyma and serous membranes which do not communicate with the bronchi, but it is also a frequent dependent upon diseases of the heart, and even of the stomach, and in many cases is caused by disordered condition of the nervous system, which is totally foreign to the chest. It is evident, therefore, that the causes of the irritative cough, are extremely various, and that the cough itself, in many cases, throws but little light upon them.

I shall now attempt to define the varieties of cough and of the expectoration, which are closely connected together.

The dry or irritative cough.—The term irritative may properly enough be applied to this variety, which is nothing but a short and quick cough,—that is, a short and rapid expiration, which is the essential character of cough. The term dry cough is so well known as the designation of this variety, that it is universally understood. It is followed by no real secretion; there is sometimes an expectoration of the small quantity of mucus which is naturally found in the fauces and bronchi. The diseases of the lungs in which it occurs, are the early stages of phthisis and

certain cases of serous inflammation. It is also an attendant upon the elongation and inflammation of the uvula, and may cease abruptly after its removal. In diseases of the stomach and bowels, and in affections of the mucous membranes of the abdomen as well as in peritonitis, the same variety of cough is observed. Indeed, we may generalize the subject much farther, and say that the short, dry cough, is the most frequent form of irritative cough, and the most persistent; and that, although in itself it is of no moment, it is often the sign of a commencing disease of the thorax. On the other hand, our knowledge of the circumstances which give rise to a dry cough, must lead us to look for other causes of it than the diseases of the chest,—and after our physical examination has taught us that there is no important lesion in the thorax, the next object will be to examine other portions of the body, and ascertain whether some disease of the abdominal viscera, or a mere nervous irritability, will not account for this cough.

Sonorous cough.—There is another variety of cough which is not very unlike the dry; that is, the sonorous cough: this is always loud, and at times very ringing and clear, so as to be heard at a considerable distance from the patient. This variety belongs to many morbid conditions: it is found in the chronic dry catarrh, but chiefly in the earlier stages of ordinary acute catarrh, before secretion has commenced. In its most marked degree, however, the sonorous cough is not indicative of diseases of the lungs, but of many and various conditions of this morbid nervous action; and, as may readily be supposed it is most apt to occur in young girls, who are much more subject than any other class of individuals to diseases attended with deranged nervous action. Hence the cough is very irregular in its indication; and although when it is of recent occurrence and short duration, it is nearly always connected with disorder of the bronchial tubes,—yet, when chronic, it is most frequently either a true nervous cough, or an attendant upon chronic diseases of the larynx, especially those in which there is a morbid growth which projects into the rima glottidis, and acts as a constant cause of irritation. This cough is therefore rather a matter which must exercise the sagacity of the physician, than a correct indication of any special disease.

The *suppressed cough* is, like the dry, a short cough; but it is checked by a voluntary effort of the patient; for as the act of coughing is, to a certain extent, independent of the will, a patient may arrest the violent expiration if he be aware that it will cause him much pain; hence the cough becomes suppressed in serous inflammations of the chest, where there is little or no secretion from the bronchi, and the pain is much more considerable than in ordinary cases of disease. In pertussis, the fear of exciting a violent fit of coughing will frequently cause it to be suppressed. In the early stages of pneumonia there is very little secretion into the bronchi; hence the necessity for cough and expectoration is but slight, while the accompanying pleuritis, inflammation acts as in cases of simple pleurisy, and suppresses the cough.

The *laryngeal cough* is various in its character; still, as it depends upon thickening or ulceration of the larynx, the tone of the cough is stridulous and somewhat stifled; at times, almost whistling. In the advanced ulceration of the larynx, which constitutes laryngeal phthisis, the cough is alternately loud and whistling, and again almost aphonic. This variety of the cough is attended with a peculiar alteration of the voice.

The *loose*, or *mucous cough*, is well known as the cough which attends the resolution of acute bronchitis, and is therefore of favourable prognosis in this disease; it is connected with a free secretion into the bronchial tubes, and is of course accompanied by mucous rhonchus, and generally by expectoration. As there are many diseases in which there is an abundant liquid secretion into the bronchial tubes, the mucous cough is very far from being confined to bronchitis; it occurs also in the advanced stages of phthisis, in the third stage of pneumonia, hæmoptysis, &c. Hence, like most of the varieties of cough, it becomes useful as a sign, chiefly when combined with other symptoms.

In certain cases of large cavities from phthisis or gangrene, the cough sometimes is not merely mucous, but it is loud and rattling; that is, as it is caused by the free agitation of the air in a large cavity, it partakes of the characters of the cavernous respiration, and differs in being much louder and more gurgling from the ordinary mucous cough.

The *spasmodic cough* is the last variety of cough which is sufficiently characterized to admit of a separate description. The type of this variety is found in pertussis, in which disease the cough is more decidedly spasmodic than in any other. But there are numerous other cases of disease, especially lesions situated about the larynx, which are attended with a severe cough, returning in paroxysms, and sometimes accompanied with a noisy, whooping inspiration. Although it is most frequent in obstructions about the larynx and upper part of the trachea, the enlargement of the bronchial glands will often give rise to it, and the peculiar cough is sometimes a valuable diagnostic sign in an affection which is always obscure. In certain cases of asthma the cough recurs in paroxysms which are often attended with a noisy inspiration.

In general terms, we may state, cough does not bear an accurate relation to the extent of the pulmonary lesion; frequently the cough seems to be almost in inverse proportion to the mass of parenchyma involved in the disease. For if a large portion of the lungs be rendered unfit for the performance of the respiration, the patient cannot make the forcible expiration necessary to produce a decided cough. It is often rather a sign of laryngeal and tracheal irritation, than of deep-seated pulmonary disorder. The cough is of less value as a sign in the aged than in those enfeebled by disease, or than in other patients, for in them it may be wanting throughout the whole course of a grave disease: the same remark is applicable to young children, who cough much less frequently than those who are older. In diseases of the lungs in general, the cough may completely cease if the brain becomes seriously involved; for a cerebral disorder renders a patient unconscious of the irritation, which, under ordinary circumstances, would give rise to severe cough. Secondary inflammation of other organs, as the stomach and bowels, sometimes produces a similar effect, but to a much less degree: this is in accordance with the general pathological law, that a severe intercurrent inflammation will obscure, and, to some extent, replace the symptoms of the primitive affection.

The cough furnishes us, also, a good means of testing whether the lung is capable of admitting the air. The act of coughing,

while the ear is applied to the chest of the patient, dislodges the secretions in the small bronchial tubes and cavities of the lung, and thus brings into strong relief many of the rhonchi, as crepitant and sub-crepitant, which before were not distinct. We therefore may often, at the end of the second stage of pneumonia, direct the patient to cough, and we are sure of finding a most abundant train of crepitant rhonchus which follows the cough, and accompanies the quick inspiration which is produced by the quick expirations which constitute the act of coughing. In the same way, in cases of phthisis in which cavities exist at the summit of the lungs, but are for the moment rendered indistinct from the difficulty with which the air enters into them, we find that they are cleared out by a strong effort of coughing, which suddenly expels their contents, and then renders them distinct.

THE EXPECTORATION.

The expectoration is less frequent in diseases of the chest than the cough; but its signs are more definite, and in some cases they afford very accurate indications of pulmonary disease. As a general rule, the sputa come from the lining membrane of the bronchial tubes, or from the larynx and trachea, and from cavities or softened portions of the parenchyma, which communicate directly with the bronchi. Hence, their value as positive signs is chiefly confined to the diseases which affect the mucous membranes of the chest. The sputa, however, may contain other liquids besides the ordinary secretions of the mucous membranes, such as blood, tuberculous and calcareous matters.

The secretion of liquids in the bronchi is necessarily independent of the will, but the expectoration is a voluntary act. It is performed imperfectly when a person is averse to making the necessary muscular exertion, on account of the pain it may give him, or other reasons; there are no sputa when the feebleness of the patient prevents his making an effort. For similar reasons, children below the age of six years do not expectorate; they do so but rarely until the age of puberty. In very old people the expectoration is rare, and not proportioned to the extent of the disease.

When the sputa are not copious, they are chiefly expectorated in the morning, on waking from sleep, during which they accumulate in the bronchi. When the sputa are copious, but the expectoration causes pain, they are also retained in the lungs until a paroxysm of coughing comes on, and they are discharged in large quantities.

Except in the cases above mentioned, the sputa are rarely wanting during the whole course of a disease, but they do not usually assume their characteristic appearance until the disease is sufficiently advanced to be recognised by the more certain physical signs. In some exceptional cases the sputa are pathognomonic, when the physical signs are doubtful, on account of the remote situation of the lesion or the state of the surrounding tissue.

1. *Of the quantity of the expectoration.*—It is small when it does not exceed a wine-glassful in the twenty-four hours; moderate, when from two to six fluid ounces; large, from six ounces to a pint, and very large if more than a pint. In descriptions of the sputa, it is advisable to state the quantity.

2. *Of the colour.*—The saliva and the mucus of the bronchial tubes are transparent; and may be more abundant than usual. A higher or rather more prolonged degree of inflammation of the bronchial mucous membrane, gives a whitish colour to the sputa, if the catarrh pass into resolution; or, if it assume a chronic form, the sputa are yellowish, and frequently of a greenish tinge, and altogether opaque. In acute inflammation of the air-vesicles and of the minute bronchial tubes, the sputa are at first transparent and colourless, but soon become tinged of an orange hue, or they are rust coloured, or even sometimes of a bright scarlet colour. In inflammations of the lungs, with great prostration, the sputa are brownish, of a mahogany colour, or like that of stewed prunes.

In gangrene of the lungs the sputa are generally of a dull white colour, but sometimes they have a yellowish tinge. In pulmonary phthisis they are in part of a whitish creamy appearance, and in part consist of a thin mucous, or muco-serous liquid. In pleurisy and other inflammations of the serous membrane of the

chest, the sputa are comparatively rare, and are usually quite transparent.

3. *Consistence and chemical composition.*—In general, the sputa, if colourless, are thin and very liquid; those that are yellow and opaque, are thick, and flow less easily. The shining transparent sputa of pneumonia, though small in quantity are more viscid than any other, are often heaped up in the centre of the cup, and adhere strongly to its sides. In one variety of chronic catarrh, and in some affections of the tonsils, the matter expectorated is very small in quantity, and almost solid. The sputa frequently consist of two parts, one more solid, and the other nearly of the consistence of water. If much air be mingled with the sputa, they are light and frothy. The chemical nature of ordinary bronchitic sputa scarcely differs from that of the healthy mucus of the bronchial tubes, but if the inflammation be more advanced, the sputa are more opaque, and become more albuminous. The increasing thickness of the sputa is a sign of a tendency to resolution in acute bronchitis, which is but slightly influenced by the mucous expectoration of its earlier stages. When pus is mixed with the mucus, the consistence is immediately increased; the thick pasty sputa which occur in advanced stages of phthisis, in which the softening is very rapid, are very consistent, and of a dirty, greyish, yellow colour, but adhere together less intimately than the sputa of pneumonia.

4. *Form.*—When the sputa are composed of simple mucous from the bronchial tubes, they run together and form a mass which is perfectly homogeneous,—and when they become albuminous, they offer no peculiar form, but are generally composed of two parts—one consisting of the whitish opaque mucus, which, in the form of shreds, is diffused through the mass of the liquid, and the other more transparent. In some cases of bronchitis, especially of the chronic varieties, in which the sputa are more albuminous than in any other, the matter is moulded into the form of the smaller bronchi, and is expectorated in little cylinders, which are diffused through the secretions of the larger tubes. The viscid, transparent sputa of pneumonia, blend together perfectly well, and form a mass which is often with difficulty separated into smaller parts: and the sputa, both of the early and

latter stages of this disease, are so nearly similar to those of different stages of bronchitis, that they can scarcely be distinguished from them. The form assumed by the expectoration of phthisis is similar to that of bronchitis in its early stages; after softening has been completed, the sputa are moulded in the cavities, and form irregular, rounded masses, with loose cottony edges; these constitute the nummular sputa; when the softening is very rapid, the sputa run together, and lose their nummular form. The sputa in gangrene of the lungs retain no peculiar form, but vary according to the consistence of the matter in different cases of the disease.

5. *Odour.*—Transparent sputa are without decided odour; the thick, yellow liquid has generally a faint, nauseous smell, which is very marked in cases of phthisis. Gangrene of the lungs is distinguished by a peculiar fœtor, sometimes gangrenous, at other times resembling the smell of moist plaster. Occasionally, a variety of chronic catarrh and one of tuberculous phthisis, in its advanced stage, are attended with fœtid expectorations.

Of the foreign matters mingled with the secretions of the bronchial tubes.—Pus is often intermixed with the mucus secreted in bronchitis, phthisis, and the latter stages of pneumonia, when the sputa are said to be muco-purulent. Sometimes a portion of the pus is uncombined, and sinks to the bottom of the mass. Blood may be intimately combined with the sputa, as it is in pneumonia, when it communicates a general rusty or reddish tinge to them; or it may be mixed in streaks with the mucus, and still retain its florid red colour; or, lastly, it may be unmixed with the bronchial secretions, when it constitutes hemoptysis. The tuberculous matter may sometimes, though rarely, be detected in the sputa under the form of minute yellowish opaque grains, not often exceeding the size of a pin's head; this appearance coincides with the softening of the tubercles. In a few cases it is sometimes found in distinct masses. Calcareous matter is sometimes, though rarely, observed when the tubercles are dry and contain much of the salts of lime. Portions of gray or dark pulmonary tissue have also been expectorated, after separation from the adjacent tissue. In cases of jaundice or pneumonia, complicated with disease of the liver, the sputa are some-

times tinged with bile. I have seen the expectoration composed almost entirely of pure bile from a fistulous opening between the liver and the lungs, following a wound of these organs.

I have confined these remarks on the expectoration chiefly to the text of a short work on physical diagnosis which I published a few years since. They might be much extended; but as the subject is one to which I shall be obliged frequently to recur when speaking of individual diseases, I do not wish to annoy the reader with unnecessary repetitions. Still it is essential for us to acquire some idea of the general characters of the expectoration. The best method of examining the sputa is to direct the patient to spit in a white or transparent vessel,—a common tumbler will do well enough for this purpose,—and then inspect them within a few minutes after they are discharged.

The chemical analysis of the sputa has thus far led to few or no practical results; for the characteristic distinctions between the various forms of mucus, albumen, and pus, are extremely slight. Indeed, it is not necessary for us to investigate, or rather to attempt to investigate, these slighter differences in the expectoration, which were at one time regarded as important. Amongst these, are the numerous tests between pus and mucus, which were sought in order to decide upon the distinctive characters of phthisis and catarrh; all these were found more or less fallacious; the best are the most simple,—that is, the yellow, purulent colour of the expectoration, when pus is mixed with the mucus, for it is rarely found in a separate state. This very admixture is one of the reasons which must make it impossible to discriminate in all cases, as to the mucous or purulent character of the expectoration. The whole subject is now placed in its proper light; the expectoration furnishes us with a most valuable secondary means of diagnosis, but one less important than many other methods of investigation that have now come into general use.

There is another class of symptoms which may be almost classed among the local signs of thoracic diseases,—that is, the mode in which the movement of the chest is performed during the act of respiration. In reference to this part of the course I shall content myself with quoting the observations contained in the work to which I have previously alluded.

ON THE MOVEMENT OF THE THORAX.

In health, the act of inspiration is performed partly by the elevation of the shoulders and ribs, and partly by the depression of the diaphragm. The passage of the air through the nostrils does not cause them to dilate evidently. When the respiration becomes difficult, the different muscles, whose action concurs in respiration, act irregularly, and much more forcibly than in a state of health. When there is much dyspnœa, without pain in any part of the thorax, all the muscles concerned in respiration act with increased energy. The nostrils dilate widely, the shoulders and ribs are forcibly elevated, and the diaphragm depressed. In acute diseases, the degree of the dyspnœa is nearly commensurate with the extent of the pulmonary affection. In chronic diseases, this is by no means the case; the patient, becoming to a certain extent habituated to disease, can often exist while a very small portion of the lungs is capable of acting, and still the difficulty of respiration may be slight. There are even some instances in which there is extreme dyspnœa, but no appreciable lesion of the lungs. When there is acute pain in the sides of the thorax, or at the diaphragm, from inflammation of the serous membranes, the parts of the chest nearest to the inflamed pleura move less than they do in a state of health. The motion becomes free as soon as the pain subsides. If effusion of liquid occur into the pleura or the pericardium, the motion of the ribs at the corresponding part is impeded by the mechanical distension, though there may be no acute pain. When the liquid is absorbed, and false membranes unite the two surfaces of the pleura, the dilatation of the diseased side is always imperfect, and remains so if the contraction is very great. The diminished motion of the side of the chest, most affected in phthisis, depends upon the adhesions produced by the frequent inflammations of the pleura.

The number of the inspirations in the adult is generally from twelve to sixteen in the minute, in some persons they may be a little more frequent, as many as twenty; but when the lungs or the pleura are much inflamed, the inspirations may increase

to thirty or forty; and, when the disease is extremely violent, the number may be as high as sixty or seventy. This extreme frequency is most remarkable when all the serous membranes of the chest are inflamed at the same time. In acute diseases the frequency of the inspirations is at first nearly proportioned to the violence of the affections; when they have lasted a certain time the patient seems to accommodate himself to a diminished supply of air, and breathes less frequently. The respiration of children affected with diseases of the chest is very frequent, especially when the lobular pneumonia has extended to a large portion of both lungs. In the state of health, even, they breathe more often than the adult. When the extreme frequency of the respiration in acute diseases has ceased, the inspiration remains more hurried than usual; sometimes it is performed in as short a time as the expiration—after which a pause ensues. In health, the time required for the inspiration is about twice as long as that of the expiration, both in children and adults.

CHAPTER V.

PLEURISY—PATHOLOGICAL ANATOMY—PHYSICAL SIGNS—SYMPTOMS—DIAGNOSIS—TREATMENT.

We now come to the study of individual diseases of the chest. These may occur in the substance of the lungs and heart, or in their investing or lining membrane. The affections of the upper portion of the respiratory system are also closely connected with those of the thorax, and will require at least a passing notice.

Both lungs and heart offer an investing and a lining membrane, which are frequently inflamed, or otherwise affected, either in connection with the parenchyma, or separately. Nevertheless, these inflammations are often met with in an isolated form, and it is then that they are most readily studied; afterwards the more difficult, because more complicated forms, may be analysed, and the symptoms belonging to the different parts may then be separated. The study of special diseases may begin with the inflammation of the serous or of the mucous membranes. In the present chapter I thought it best to deviate somewhat from the ordinary course, and shall commence the study by the examination of the serous membranes. These are the most simple of all the tissues composing the lungs, and the symptoms of many of their diseases are nearly as regular and readily learned as their pathological lesions. Still, in all such cases, we must beware of the difficulty into which an imperfect study of the subject may sometimes lead us; for in diseases of the chest, more than in any others, a partial analysis, and a limited diagnosis, may become the sources of error. We must prosecute the examination until we have arrived at the knowledge of all the symptoms; otherwise the physical signs may limit our views, instead of extending them, and we may rest satisfied with the discovery of a single disorder, instead of taking into the esti-

mate the numerous diseases with which it may be complicated. This is a common error with those who are commencing the study of auscultation; they are apt to be too well satisfied with a partial discovery of the symptoms, and to forget that many other things may be concealed which a more thorough examination would explain.

Pleurisy, as is well known, is an inflammation of the serous membrane involving the lungs; it is very regular in its progress and symptoms. Like the other inflammations of this tissue, it is sometimes simple and readily diagnosticated, and at other times is singularly complex, or perhaps consecutive to other disorders of a different and more constitutional character. For example, it may be connected with tuberculous diseases in several ways: first, tubercle may be developed in the adherent and more cellular portion of the serous membrane, and the inflammation may directly coincide with this development; in these cases the tubercular deposit is formed, as it were, by the same process as the inflammation, and apparently by the same action of the vessels. In other cases the pleurisy is consecutive to the tubercles already formed in the lungs; in a third variety the pleurisy may attack an individual in good health, and afterwards give rise to the tuberculous deposit, partly from the general shock given to the constitution, and partly from the determination of the diseased action towards the lungs. This latter variety usually occurs in persons of a tubercular tendency; but it may prove a purely accidental cause of tubercles, and take place in those whose constitution is not previously tainted by this diathesis. Pleurisy also occurs in a more acute form as a complication of affections of the parenchyma of the lungs, when they approach the surface of the organ invested by the pleura. Pneumonia is the disease of the lungs which most frequently gives rise to this form. There are some other lesions producing the same effect, which are, however, of rare occurrence, viz., gangrene and scirrhus; when these approach the surface of the lung, they cause inflammation of the serous membrane, with an effusion of lymph,—this inflammation being in almost all cases preservative, as the adhesion which takes place prevents an effusion of the morbid matter into the cavity of the pleura.

We have, then, three principal varieties of pleurisy,—1st, simple pleurisy; 2dly, pleurisy complicated with a deposition of tubercular matter; 3dly, pleurisy complicated with acute lesion of the parenchyma of the lungs.

The pathological changes connected with ordinary pleurisy are regular in their progress, and proceed, step by step, with the symptoms, which afford us a means of measuring the intensity of the inflammation.

The first change which takes place is the injection of the membrane, caused by an enlargement of its vessels, which, in the natural state, do not transmit the red globules of the blood. These vessels are situated in the subjacent cellular tissue, and are disposed in an immense number of branches, which are interlocked in various directions, and form a complete network. In the midst of this, there are numerous bright red points, apparently formed by minute extravasations of blood from the vessels.

Almost simultaneous with this increase of vascularity is the development and effusion of lymph. This is at first deposited on the serous surface in minute points, which are transparent and scarcely visible, but may be readily detected by the touch. These points, as they become more numerous, gradually collect into groups, which, finally coalescing, form a continuous membrane. This deposit of lymph has received the name of a false membrane, and is more abundant at the lower portions, where it is in some cases as much as a fourth or even half of an inch in thickness, while at the upper portion it seldom exceeds an eighth of an inch. The character and amount of the effusion vary according to the form of the disease, and the constitution of the individual affected. In cases of local pleurisy, especially if occurring in robust persons, the amount of serum effused is very small, while there is a considerable deposit of lymph; the same also occurs in persons who are not robust when the inflammation is confined to a small portion of the membrane. On the contrary, if the patient be thin, and of a lymphatic temperament, and the inflammation diffused, the effusion of serum will be very great, with but a slight trace of lymph. The thin and serous part of the effusion tends to diffuse itself over the surface of the pleura, gravitating to the most dependent portion, and

shifting its position with the movement of the patient. When, however, it is principally composed of lymph, it is confined to the part of the lung which is affected, and exhibits no such tendency. The serum increases in quantity as the disease advances, and decreases with its decline; but the lymph is more persistent in character; and, instead of being removed, becomes organized, and assumes the character of a serous or cellular membrane, according to the circumstances in which it is placed. When the inflammation continues for a considerable length of time a secretion of pus takes place, and the serum is entirely replaced by purulent matter. The lymph in this case being bathed in pus is modified in colour by its assuming a yellowish hue. When the serum is abundant the lower portion of it is quite turbid, while the upper portion is comparatively clear. This results from the greater specific gravity of the lymph, in consequence of which it settles to the bottom of the fluid, which thus assumes a dull white or yellowish colour.

During the recovery of the patient, the following changes are observed to take place. As the serum is absorbed, the pressure of the atmosphere forces the parietes of the chest towards the lung, and adhesion takes place between the two surfaces of the pleura. As the lung is compressed against the spine, and in that position is covered with a coating of lymph, it often remains permanently flattened, so that it cannot rise to meet the ribs. In those cases in which the pleurisy is slight, and the effusion very small, there is either no contraction of the chest, or it takes place to a very slight degree. The contraction is not entirely permanent; the lung after being compressed does again expand to a certain extent, and rises partially towards its original form.

The adhesions become gradually organized during this process, and new vessels are formed in the lymph. The particles of blood are deposited in the lymph under form of dots, and gradually collect in trains or streaks; vessels are afterwards formed around the blood, which then finally inosculate with the original vessels of the subjacent serous tissue. The contraction of the chest is not great when the serum is but moderate in quantity; but in cases of abundant effusion, the contraction is

equally well marked with the previous distention. The alteration of conformation, therefore, is a purely pathological state, which corresponds accurately with the quantity of liquid exhaled. If, therefore, the effusion be limited, it does not produce a very decided dilatation, or subsequent contraction: a less quantity than a pint is scarcely appreciable; a quart gives rise to a very decided alteration in the shape of the chest, and larger quantities distend it sufficiently to incline the body towards the sound side. In the same way, if the contraction which follows pleurisy be very great, the whole body is sometimes inclined towards the diseased side.

The nature of the liquid is not always the same; the greatest portion of it consists of serum in the early or inflammatory conditions of the disease. This is mingled with flocculi of lymph of various density, which seem to be detached from the surface of the pleura. In the chronic varieties of the disease, the liquid consists almost exclusively of purulent matter, although at first the serum is merely tinged with pus from a small admixture of globules with it; but as the disease continues longer and becomes chronic, the purulent globules become gradually more and more abundant, until the liquid consists nearly of pure pus: the pleurisy is then often called empyema. It is in these cases that the distention of the chest is greatest. In the early stages of some cases, pus is mixed with the serum and lymph in small quantity, giving the liquid a slightly yellowish tinge; but, as a general rule, it is quite transparent, but of a light greenish yellow colour. In a few instances it coagulates spontaneously immediately after death, becoming a mass of tolerably dense albumen. In a number of cases it contains blood in small quantities, and occasionally, although rarely, the proportion of blood is large. These varieties in the exhaled fluid belong to the same disorder, which is in all these cases inflammatory; but the product varies according to the general condition of the individual's previous health, and other circumstances difficult to discover. In general, the product of inflammation of the pleura, and other serous membranes, is most consistent and most highly animalized when the patient is strongest, and the disease most violent.

These changes are very regular, and give rise to an equally

regular succession in the physical signs. When the inflammation is severe, and the effusions very large, these signs are pathognomic of the disease; but when it is small, the physical characters are so far useful, that they either confirm the indications of the functional signs, or prove that the disease is not advanced beyond a certain point. When the effusion of serum takes place, the sound on percussion is immediately dull,—becoming gradually flat as the quantity of the liquid increases. The flatness is much more decided at the lower than at the upper portion of the chest, and becomes gradually less in ascending towards the summit; for the liquid of course gravitates towards the most depending portions. Still, the serous effusion is not the only cause of the flatness; it depends, in part, upon the thick deposits of lymph at the inferior portion of the lungs, and does not disappear entirely when the position of the patient is changed, although a change in the level of the liquid is always attended by a change in the degree of flatness. If the effusion be very large, the flatness gradually becomes more complete, and at the same time extends over the side of the chest, until the resonance is either completely lost, or is limited to a small portion of the chest near the spine, where the lung generally contains a little air. The increase in the flatness enables us to estimate the extent of the effusion with great accuracy; but the converse of this is not true in its declining stage,—for when the compression of the lung is carried to a great extent, it recovers its elasticity but slowly, and remains either permanently or for a long period in a more solid state than is natural; hence the clear sound returns slowly, and generally never recovers its original sonorousness. A moderate but diffused resonance does not, therefore, prove that the lung has not recovered from the inflammation: it merely shows that the lung remains a little compressed either from the adhesion which follows the inflammation, or from lymph which is not yet absorbed.

The enlargement of the affected side accords with the dulness on percussion, and is always met with when the dull sound is at all decided. If, in the early stages of the pleurisy, we examine the lower and posterior parts of the chest, we may readily detect slight changes in the conformation; and this is then gene-

rally limited to an alteration of the natural convexity of the thorax, and is scarcely perceptible in the whole semi-circumference. The quantity of liquid which is sufficient to cause a decided change in the conformation varies from a pint to several gallons. When it exceeds a gallon the distension is of course very great. I have, on one occasion, in which the bulging of the affected side was immense, found several gallons in the right pleura. In these extreme cases the healthy lung is compressed towards the ribs of the opposite side, at the same time that the diseased one is forced against the spine, and death usually occurs from suffocation. The semi-circumference of the chest may be measured with a tape on a level with the sixth or seventh dorsal vertebra, in order to give us an idea of the changes which take place in the quantity of the liquid; but this method is of little use except in cases in which the effusion is very large. And it must be always remembered that the right side is naturally larger than the left; if we do not attend to this fact our conclusions may be very erroneous. The position of the heart is another sign which is closely connected with the alteration in the conformation. If the pleurisy occur on the left side, the heart is sometimes forced to the right of the sternum; if, as is most frequent, the pleurisy attack the right side, the heart is removed towards the left axilla.

The respiration in the early stages of pleurisy is always feeble at the lower part of the affected side,—that is, if either the pain is tolerably acute, or the effusion at all considerable. But at the beginning the feebleness depends much more upon the pain which prevents a full inspiration than the mechanical pressure of an effusion which is still quite small in quantity. When the dilatation of the vesicles in a part of the chest is attended with pain, that portion of the lung becomes to a great degree motionless, and remains so until the pain diminishes. This rule is so general in its application, that if the serous membranes of the chest be inflamed to a great extent, and over both lungs, the patient may perish from the dyspnœa which arises from the inactivity of so large a portion of the pulmonary tissue. The feebleness of the respiration continues throughout the disease in those portions of the lungs in which the bronchial tubes are small; where they are much

larger the respiration becomes more or less bronchial, or at least rude. The intensity of the rude respiration varies very much, and chiefly according to the condensation of the lung; when this is very great the bronchial respiration is very intense, sometimes quite as loud as in the most severe cases of pneumonia. The condensation of the substance of the lung is, therefore, a circumstance which favours the bronchial respiration. The density of the effused liquid compressing the tissue of the lungs is another cause of the loudness of the bronchial respiration: if there be a large proportion of lymph, or a thick, viscid liquid in place of the usual thin serum, the conducting power of the substance which intervenes between the tubes and the ear is increased, and the respiration becomes almost as bronchial as if the lung itself were inflamed.

When there is bronchial respiration in pleurisy the resonance of the voice becomes bronchial, and you will observe a true bronchophony. This has, however, a peculiar vibration or quivering in its tone, which never exists to the same degree in pneumonia proper. If the bronchial respiration is not so loud the resonance of the voice becomes less bronchial, but its vibration is increased, and its resonance is termed egophony. This takes place in those cases in which the effusion is but of moderate density, or little more thick than ordinary serum; and it is heard most distinctly from the anterior portion of the axilla to the scapula, and between this bone and the spine. It is therefore most evident when the bronchial tubes are moderately large, and there is a tolerably strong compression upon the vesicles. The depth of tone of egophony is modified by the density of the liquid more than any other cause; if the liquid remain thin, the egophony will continue; but in proportion as the density of the lung and of the effused fluid approaches more nearly to that of pneumonia, the resonance becomes more like bronchophony than egophony. When the egophony is perfectly pure, it is less loud, and often less easily recognised than in those cases in which the body of sound is decidedly increased by the hardness of the lung.

In certain cases of pleurisy there is little resonance and no vibration of the voice; this must depend upon the obstructions,

which prevent the passage of the air through the tubes, and of course destroy the resonance. It is difficult to state what these obstructions are; in some cases they may depend upon the pressure of the liquid upon the tubes, in such a manner as to interrupt the column of air, or upon accidental collections of liquid in them. If the lung remain soft and uncompressed, it will also give rise to an egophony which is but moderately loud; the circumstances, therefore, which favour its development, are moderate pressure and a little increase in the density of the tissue of the lung. If the voice be shrill and clear, the egophony is of course much more decided.

The friction sound is another sign of pleurisy, which is more frequently met with than the resonance of the voice. It occurs under two different circumstances, at the beginning and towards the termination of the disease,—that is, at those times in which the effused matter consists almost exclusively of lymph, and not of serum; for if there be a large and thin effusion, the friction of the two surfaces of the pleura, which is the essential cause of this sound, will be prevented. When this sound occurs early in the disease, it of course takes place in the variety of pleurisy which may be termed dry, whether it continue in that stage or not; the friction is then very slight, and is inappreciable by many persons; it is more like the slight noise produced by rubbing together two pieces of tissue paper than anything else. At the close of the disease, after the absorption of the liquid, it is more regularly observed, indeed I believe that the sign exists in the larger number of cases, with but few exceptions. But it is often not heard unless the ear be applied about the lower angle of the scapula, at the moment the patient takes a full inspiration; it may be then distinctly recognised, and is often perceptible to the touch as well as the ear. It is then much louder, and offers the peculiar character of the true friction sound. This is sometimes quite permanent, lasting several days, or even much longer. These irregular sounds are not of value for the proper diagnosis of pleurisy; they are only of accessory importance, and should be recollected by us, because everything should be known which may become of use under any circumstances.

The signs of the lungs, properly speaking, are of great nega-

tive importance in the diagnosis of pleurisy. In fact, it is at times impossible to distinguish the cases in which the lung is unaffected in any other way. If, therefore, we find no signs of pulmonary disease, such as are indicated by the rhonchi and respiration, the case may be regarded as one of simple pleurisy. But, in order to form this opinion, we must take into the calculation both the general and local signs of pulmonary disease; and even then it will stand good only for the time, for we may be afterwards obliged to modify our opinion. Still, in simple pleurisy, it should be recollected that there are no signs of disease of the lungs, other than those which arise from their consolidation by the pressure of the liquid. In practice, the complicated cases are probably quite as frequent as those which are more simple.

In the recovery from pleurisy, restoration to health takes place but slowly, and the lung does not recover its natural respiration for a considerable time; the sound remains feeble, and the percussion dull: after a very long period, sometimes a year or more, the restoration to the natural fulness and softness of the respiration may take place; but this is not to be anticipated in the great majority of cases attended with a large effusion in which the inspiration will remain feeble, and we must therefore be satisfied with a slow and gradual improvement.

Besides the physical signs there are other symptoms of pleurisy, which are, to a certain extent, quite conclusive. These are generally most decided in the commencing stages of the disease, and they may subside almost entirely, and be almost forgotten by the patient. The diagnosis of the disease is therefore easiest, by the general symptoms, at its very commencement, when the physical signs are most obscure. We are also obliged to rely chiefly upon the rational symptoms in those cases in which the adhesions between the two surfaces of the pleuræ are strong, and of course no effusion can take place; this is always the case in pleurisy which has succeeded to a former severe attack of the same disease.

Of these local, but at the same functional, signs the most prominent is the pain. This is so acute in many cases of pleurisy that the ideas of pain and pleurisy are very firmly associated in

the minds of most persons, and they are apt to believe that all cases of pleurisy must be attended with pain: this is an error; for the pain may either be totally absent, or may be so obscure as scarcely to attract attention; it is then limited to a mere soreness along the portion of the chest most affected. When there is severe pain, it is almost always felt near the nipple; it is acute and lancinating, similar to that caused by the prick of some sharp instrument; hence it is in many languages called a stitch in the side. It is increased by motion, cough, or even respiration. When the inflammation is very sudden and extensive, the pain may be agonising, and for a time effectually check the respiration. A large quantity of effused liquid rather diminishes than increases the pain; and when it becomes very large, as in very chronic cases, the pain is often limited to a mere soreness, which is often seated in the loins instead of the thorax. This seems to depend upon the great weight of the thick purulent liquid. In diaphragmatic pleurisy, especially when caused by rheumatic or gouty disease, the pain is difficult to localize, and is generally wandering about the lower part of the thorax, causing more distress than other varieties of the disease. We see, therefore, that the pain is an important symptom of the disease when it exists, but that it is never lasting in the slow and moderately severe cases of pleurisy, and may be either entirely absent or badly characterized throughout the disease.

The cough is another local symptom: this is generally present in the milder cases of pleurisy, and is always short and almost insignificant. If the inflammation be very acute, the cough is almost entirely suppressed; and even in moderately severe cases it is in a great degree checked by the aversion of the patient to make the strong respiratory movement necessary to produce a full cough. It is not attended with expectoration in the simple inflammation of the pleura, for there is of course no secretion to be thrown off externally, unless the substance of the lung or the bronchial tubes are involved in the disease. Hence many of the remarks which we may find in some of the older writers upon this subject are in reality applicable to pneumonia, and not to pleurisy. The more chronic the disease be

comes the less disposition is usually felt to cough, so that in cases of extensive empyema there is often no cough.

The mode in which the respiration is performed is sometimes of importance. In the beginning of the disease, when the pain is severe, the patient breathes chiefly with the healthy lung: this arises from the pain which is caused by the act of respiration as well as coughing. When the disease is more advanced the mechanical pressure upon the affected lung will prevent its expansion. Hence the patient throughout the disease breathes chiefly by the healthy side.

The decubitus in pleurisy is sometimes of importance. When there is pain, you may state in general terms that the patient does not lie upon the affected side, which is extremely sensitive to pressure. Even late in the disease he will prefer the sound side, or the back; but when the effusion is so great that the weight of the liquid would press upon the mediastinum, and thus prevent the expansion of the healthy lung, he will naturally prefer lying upon the diseased side, and will thus relieve the lung which remains in a state fit for the performance of its proper functions.

The rational as well as physical signs which I have just described, are those which belong to pleurisy considered chiefly as a local affection. There are many other symptoms which appertain to it in common with other inflammations of the serous tissues. These phlegmasiæ present a number of characters similar to those of other inflammatory affections, and some that are nearly peculiar to themselves. In general, the serous tissues, like other membranes, modify the ordinary characters of inflammation, rather than offer others which are strictly novel.

At the commencement there is usually a chill, which varies in intensity from a slight sensation of coldness to a complete chill. This is generally felt at the same time with the pain,—that is, the pain in the chest seems to excite the chill; it may return at several different times throughout the disease; but it then rarely offers the same intensity as on the first day. The chill is followed, of course, by heat, and by sweating, which occurs at irregular times, and is not often very copious. During

the disease the fever is generally persistent, and is characterized by a quick, tense, but rather small pulse. This is often called the pulse of inflammation of the serous tissue; and although not regularly present in all cases of these diseases, it is found in a large proportion of them. The sweats in pleurisy are sometimes extremely abundant, especially in the varieties of the disease that are complicated with a tuberculous development; but even in simple inflammation of the pleura they are sometimes extremely copious, and form a harassing and alarming symptom. In empyema, the nature of the fever approaches the hectic type, and almost always assumes it when the operation of paracentesis has been performed, and a free communication is made between the external air and the purulent collection. In the latent form of pleurisy the fever may be quite moderate, rather a slow febricula than a perfect fever, and this is one of the causes which render this form of disease extremely obscure.

The secondary irritation and inflammation of other viscera, which are so frequent in the inflammations of the mucous membranes and the parenchymatous organs, are very slight in pleurisy and serous inflammations in general. The disturbance of the alimentary canal is strictly proportioned to the intensity of the fever, and not to the gravity of the inflammation, which pursues a course almost unconnected with the viscera of the abdomen. The strength and the cerebral functions are usually just so far affected as naturally results from the severity of the pain and the degree of fever; they are, in themselves, very little disturbed by the inflamed pleura. Hence pleurisy is a remarkably simple disease, if it be the primary affection; it frequently occurs as a complication, but has little power to give rise to disorder of other tissues. This is explicable enough when we reflect upon the simple structure and few nervous relations of the serous tissues. There is, however, one exception; that is, the tuberculous diseases, whose development is sometimes singularly favoured by pleurisy.

The diagnosis of pleurisy is readily enough made in most instances: a well-characterized case is always certainly known, and can be confounded with no other affection. That is, when

the distension of the chest, the dulness on percussion, and feeble or bronchial respiration, coincide with dyspnœa, pain, and fever. If we restrict our diagnosis to the functional signs, we shall, of course, be somewhat puzzled in many cases: but with the aid of the physical signs, all decided cases can be mistaken for nothing else. In the slighter cases, where there is little or no physical change, this is not always the case: pleurisy may be confounded with pleurodynia, or simple rheumatic pain in the intercostal muscles and the adjacent fibrous tissues. The fever is a very uncertain test; but it has a collateral value, for it is more apt to accompany true pleurisy than simple pleurodynia. The nature of the pain is a better one; for, in pleurisy, this is, to a certain degree, limited, and almost always is found about the anterior margin of the axilla; but in 'pleurodynia' it shifts about, and is often found on both sides at once; very frequently it disappears for a time, but soon returns, displaying in this respect the peculiar changeable character of rheumatic disease. When severe fixed pain occurs during the course of inflammatory rheumatism, we need not trouble ourselves about the diagnosis,—for in such cases there is almost always something more than a mere rheumatic pain, and the pleura is positively, though perhaps slightly, inflamed. As a general rule, therefore, if in the suspected pleurisy the pain is at all constant, we may regard it as a true inflammation. The mobility of the pain is therefore the only good proof of pleurodynia. There is no difficulty in distinguishing between simple pleurisy and pneumonia, or other diseases of the parenchyma of the lungs, with pleuritic complications; for the signs of true pulmonary disease are of course wanting in the one case, but present in the other. The inflammation of the pericardium frequently occurs in connection with pleurisy of the left side, when it is sometimes extremely difficult to recognise it; for the signs of one disease, to a great extent, obscure those of the other. If the pleurisy attack the right side, the distinctive characters of the two diseases are quite evident.

In simple pleurisy our prognosis is almost always favourable if we see the patient rather early in the disease; if the effusion be very large, or if the disease be chronic, it is then quite doubt-

ful: the mortality is totally different under these circumstances. In the secondary pleurisy, or in that variety which is accompanied by tuberculous disease, the prognosis is of course much less favourable. When it precedes tubercles it usually ends in recovery, but afterwards phthisis will occur.

The treatment of the ordinary pleurisy,—that is, of the disease as distinguished from those in which pneumonia plays the most important part, is based upon well-established grounds. It is strictly antiphlogistic,—and, as in other inflammations of the serous membranes near the surface of the body, it is most effectual when we use local depletion in combination with or in addition to general bloodletting. The latter remedy, however, is always productive of great relief in the cases which begin with strong inflammatory symptoms,—that is, much pain and dyspnœa; there is, then, no substitute for it. After we have taken a moderate quantity of blood, however, and have relieved the pressing symptoms, the indications are then rather to continue the treatment by local depletion and by diaphoretics than repeated general bleeding. Cupping or leeching to the painful parts, repeated if necessary, two or three times, is then the best remedy. The effects of local bleeding are much more prompt in serous than in mucous inflammations, or in diseases of the parenchyma of organs. Cups or leeches may be repeatedly applied in either acute or chronic cases; but we will gain most from them if we choose the moment when the pain is most acute; it will then often yield very quickly, and the disease improve after free local bleeding.

There are several other local remedies which are effectual in relieving the pain and inflammation besides cupping and leeching: these are warm poultices of hops, sprinkled with a tea-spoonful or two of laudanum, and kept warm by placing over them a bottle or tin vessel filled with hot water, which should lie on the bed by the side of the patient. The narcotic acts with considerable energy upon the part, and its action is favoured by the warmth and moisture. In slight pleuritic pains, as well as in the true pleurodynia, sinapisms are eminently useful; but they are of little benefit in severe pleurisy. This is not the case with blisters, which belong to that established class of remedies whose

virtues have been tested by the experience of many generations; they are used with two objects in view—to relieve the inflammation, and to favour the absorption of the effused fluid. While the inflammation is still advancing, the operation of blisters is uncertain, and sometimes seems to be positively injurious; but after the active inflammatory symptoms have been checked, they are productive of decided benefit, and are perhaps, of all remedies, those whose action is most unquestionable. The acute pain often subsides immediately after vesication, and the absorption of the effused liquid sometimes takes place very rapidly. The rapidity of absorption is not generally proportioned to the quantity of the serous secretion from the blister, although in a few cases a very copious discharge will pour from the vesicated surface, and the pleuritic effusions may disappear in a few hours. In chronic cases of pleurisy, blisters are amongst our most valuable remedies; but they should be small and very frequently repeated. My own plan is, not to make them larger than two or three inches square, and to apply them every two or three days, dressing the surfaces with simple cerate: you should, in this way, pass over a considerable part of the affected side by applying these small blisters successively to different parts of it.

When the pleurisy has been entirely or nearly removed, the patient often complains of slight returns of the pain from exposure to damp, or to a cold wind. The only way of guarding against these slight returns of the inflammation is to cover the affected side with a Burgundy pitch plaster, and to direct your patient to clothe himself warmly.

These, then, are the directly depletory remedies, and such as act as local counter-irritants. The internal remedies suited for the treatment of pleurisy are numerous, and applicable either to different cases of the disease, or different stages of the same affection. They may be divided into three principal classes: —1st. The antiphlogistic remedies, which are intended to relieve the inflammation, and check the fever. 2d. The remedies that promote absorption, which, however, are often fitted at the same time to check the inflammation. 3d. The anodyne, which may relieve the pain. Of course, in a strictly inflam-

matory disease, the first class of remedies, and those which belong both to the first and second classes, are the most important. The tartarized antimony has long been used both in simple pleurisy, and in the disease complicated with pneumonia; it is usually given as a diaphoretic, in the doses of a fourth to the eighth of a grain,—rarely in larger doses. In these doses its nauseating influence is but slight. In the early stages of pleurisy, free diaphoresis is a powerful therapeutic agent,—but in the more advanced cases, sweating is productive of comparatively little benefit; its good effects are most evident in those stages of the disease in which resolution is practicable before there is much effusion into the pleura; that is, it is a means of depletion from the vessels, and exercises comparatively little influence in promoting absorption. In chronic cases of pleurisy the tartar emetic should either be given up altogether, or restricted to very minute or merely alterative doses.

The tartar emetic is almost the only remedy which is nearly exclusively antiphlogistic in its action; most other internal remedies are more powerful from a combined action in promoting absorption, and checking inflammation. The most important are mercury, nitre, and digitalis; squill and colchicum are also powerful remedies, and act like most other diuretics of a moderately stimulating character. Of these the most efficient is mercury. Mercury, given in moderate doses, so as not to disorder the bowels, produces two distinct effects; one is directly antiphlogistic, the other is the influence which it exerts upon secretion and absorption. In the treatment of pleurisy in its active inflammatory stage, the first action of mercury is that which is most beneficial; in the advanced cases of purulent effusions, the inflammatory character of the disease is less marked, and the action of the mercury is chiefly limited to the absorption and elimination of the effused matter from the body. In the more acute cases we may give mercury more rapidly, in the chronic cases more slowly. Thus, I would advise a quarter of a grain to half a grain of calomel to be given every four hours if we design it as an antiphlogistic: it will then produce its specific effect in a short time, and the disease will generally decline. The mercurial treatment is, of course, but a sorry sub-

stitute for bloodletting, which it should follow and assist, but not replace. If the mercury be used towards the decline, or in the advanced periods of the disease, when our object is more to promote absorption than to remove the inflammation, we should give the calomel in much smaller doses, that is of an eighth or a sixth of a grain three or four times a-day; this operates but slowly, and is much more effectual in increasing the power of other alteratives than larger quantities.

The mercurials are usually combined with other remedies, which will work, as it were, in the same direction with them. Thus, in the early stages of the disease, Dover's powder, or the simple opium and ipecacuanha, may be given with them; if full diaphoresis is brought about by these means the disease is more easily subdued. The Dover's powders should be given in doses of about three grains every four or five hours. The opium and ipecacuanha should be given in doses of a quarter or third of a grain of the former, and one grain of the latter. In the advanced stages, digitalis and nitre act admirably as diuretics. Digitalis should be given in doses of a grain of the powder three times a-day, or the half of a grain to be taken more frequently. The tincture of digitalis may be given in doses of ten drops, three or four times a-day. The nitrate of potash should be given in solution of it in flax-seed tea, in the proportion of about one drachm to a pint of the infusion. There are cases in which others of a more stimulating kind, as the juniper berries, or spirits of nitre, come in well; but these are chiefly such cases as approach very nearly to hydrothorax: there is then a feeble condition of the economy, and but little active inflammation.

The diaphoretics of a vegetable kind are, like many other remedies, adapted for various stages of pleurisy. In the early stages, full diaphoresis acts admirably as an antiphlogistic remedy, while in the advanced stages it may increase in absorption, and remove the effused fluid. The latter effect is, however, very uncertain: for the disease naturally tends to produce sweating, and the perspiration seems an abortive attempt on the part of nature to throw off the disorder,—the curative action being quite disproportioned to the diseased one.

Anodyne remedies in the treatment of simple pleurisy are

merely palliative, and are, therefore, rarely given alone. They consist almost entirely of some form of opium, except in those cases in which the patient is unable to take any preparation of this drug; we are then compelled to resort to various substitutes. We must not, however, suppose that opium is insignificant, or of no value, because it is simply a palliative; for in pleurisy, as in other inflammations, the relief of pain prevents the increase of the disease, and is indirectly one of the effectual aids towards its cure. The only objections to its employment are to be found in those cases in which the cure takes place chiefly by secretions which must be thrown off from the body: this is not the case in inflammation of the serous tissues, for in these the liquid is necessarily retained until it can be removed by absorption and the adhesion of the coagulable lymph. There is, then, no permanent therapeutic contra-indication to the use of the opiates; if the skin be dry, they should be given in the form of Dover's powders, from eight to twelve grains of which may be given in divided doses during the day. If the sweating be copious, morphine will, as a general rule, be the best remedy, administered chiefly at night, in the ordinary doses of an eighth to a quarter of a grain. This is sometimes necessary for a considerable period.

When we find the pleurisy nearly well, but the patient still complaining of some dyspnœa, or a little feverishness, and we discover on examination that a portion of the liquid remains unabsorbed, nothing is so efficacious as a journey, with its necessary consequence, change of air. Although the sea-air is not always adapted to pectoral diseases, it is often of decided advantage in chronic pleurisy, especially if combined with a voyage. But a course of this kind is necessarily attended with no little expense and inconvenience, and is totally beyond the reach of many of our patients: we will be obliged to resort more frequently to land journeys, as a less troublesome and sometimes as efficient a course. This is generally the surest means of dissipating the remains of the disease, and insuring a restoration to entire health. Of course, the usual hygienic precautions as to the dress should be adhered to.

There is no disease in which the treatment is more influenced

by a knowledge of its symptoms and pathological relations than pleurisy; for, simple as it is, the success in chronic cases depends chiefly upon steadily watching the physical condition of the chest, and persevering in our care until the disease is entirely dissipated.

VARIETIES OF PLEURISY.

Besides its simple form, pleurisy presents many varieties which are, for the most part, connected with various structural alterations of the lungs, or with peculiar symptoms of the disease itself. I have already given a passing notice to several of them; but they require something more, as they constitute the most difficult cases of the disease.

There are also other varieties of the disease which differs from the usual form, but at the same time are not connected with an important change in the substance of the lungs; that is, latent and chronic pleurisy. These are sometimes closely connected together; thus, latent pleurisy with large effusion is almost always chronic, but chronic pleurisy is not necessarily latent. The same is not the case, however, at the commencement of the disease, for pleurisy may then assume the character of a latent disorder, and be even attended with a considerable effusion without showing the usual symptoms—but the large effusions of pus which are latent, and unattended with the usual symptoms, always belong to the chronic variety of the disease. I shall first allude to the variety of it which follows a primative acute pleurisy.

It is difficult in many cases to say what renders an ordinary acute pleurisy chronic; sometimes it is evidently a badly-treated case of acute pleurisy, and the inflammation continues, although some of its symptoms may cease. At other times the inflammation has either entirely resisted the ordinary remedies, or it has recurred after having nearly ceased. Both of these varieties present the same symptoms; the physical signs are similar to those of acute pleurisy, but there is evidently an increase in quantity and weight of the effused liquid; hence the prominence of the chest, the displacement of the viscera of the abdomen and thorax, and the flatness of the chest, are all much more decided

than in ordinary pleurisy, while the bronchial respiration, as well as the egophony, gradually ceases. I have already stated that the general signs of acute pleurisy, such as the inflammation, fever, and severe pain, may gradually disappear; but the fever is apt to recur, and changes its type, either resembling hectic very closely, or becoming perfectly identical with it. The fever is one of the most troublesome and alarming symptoms of this variety of pleurisy; for in other respects the patient does not suffer in a manner proportioned to the extent or the duration of the effusion. I once saw a patient who had performed the full duties of a sailor, going aloft, &c., with an enormous pleuritic effusion; when he returned from sea, it amounted to two or three gallons. This is an exceptional case; but it is very frequent to find patients who can perform many laborious occupations without much inconvenience: it is generally the case if the dyspnœa be not severe, and you will find that some patients complain of little difficulty of breathing with an extent of pectoral disease which will give rise to great distress in other individuals. The symptoms which so frequently characterize chronic organic diseases are extremely variable in this variety of pleurisy: these are emaciation, loss of firmness of muscles, harshness and dryness of the skin, and slight œdema of the legs. Sometimes they are nearly as well marked as in tuberculous disease of the lungs,—in other cases they are very slight; hence they constitute a diagnostic sign of the disease: and if we find them well characterized, we will do right to regard the case as one probably complicated with tubercles; if our impression be erroneous, we will soon rectify it, as the symptoms will gradually become more decided in the latter case, and slowly disappear if the pleurisy be followed by recovery.

The diagnosis of chronic pleuritic effusion is often quite impossible without the physical signs, for its symptoms are sometimes nearly similar to those of phthisis. When the physical signs of the disease are present, there is no difficulty in ascertaining it; if it be complicated with tuberculous deposit, the case should be regarded as one of great danger, and the diagnosis is, as we shall afterwards see, much more difficult.

I have already alluded to the prognosis in this variety when

speaking of ordinary pleurisy; it is always doubtful, if the effusion be very large, for the liquid then consists nearly of pure pus, and of course the irritation caused by it may be sufficient to produce marasmus, and may, perhaps, deprive the patient of the strength necessary for a cure. The disease may occasionally, though rarely, prove fatal, from the mere obstruction to breathing. The liability of the disease to give rise to secondary tuberculous deposit, after the absorption of the pus, is also to be taken into our account: this forms a variety of the tuberculous pleurisy, in connection with which I shall presently treat of it. There is another way by which chronic pleurisy may terminate fatally,—that is, by producing metastatic abscesses in parenchymatous organs, as the lungs or liver; this result is, however, not common.

The treatment of chronic pleurisy differs so little from that of the acute variety, that I have treated of it at some length in connection with the latter disease. The inflammation is in both cases essentially the same: but, as it has become chronic, it requires chronic remedies, adapted to protracted cases: as a general rule, these should be such as are at the same time antiphlogistic, and favour the absorption of the pus. But in using these remedies we must not commit a common error, and attempt to force nature through a process which is essentially a slow one: thus, if we subject the patient to what is called a vigorous treatment, we rather impede than favour the cure, and the strength may fail in the attempt. It is on this account that I advise the repeated application of small blisters, warm clothing over a large portion of the body—which is a mild, but powerful means of counter-irritation—and the careful administration of the mercurials and other remedies favouring absorption. Sometimes tonics are necessary in very old pleurisy, as in other diseases in which there is an abundant suppuration; for the strength may fail at the critical point when the largest demands are made upon it. In these cases the essential remedies are the chalybeate preparations, which we may use from time to time, and occasionally either combine or alternate them with the vegetable tonics; but as the influence of the latter is much stronger in restoring the state of the digestive functions than in producing a decided

alternative effect upon the general system, they are rather secondary remedies. I have already alluded to the good effects of travelling, and even of a sea-voyage in the treatment of chronic pleurisy.

There is another cutaneous tonic and alterative which may be properly combined with them; that is, stimulating baths, especially the sulphur and salt-water baths. These are generally taken at natural sources, by resorting to the sulphur springs or sea-bathing. They are much more powerful and more safe, taken warm, than cold, especially if we use the artificial baths. But sea-bathing, or bathing in cold sulphur-water, is sometimes, though rarely, advisable as a mere tonic, when the patient is simply debilitated, and the inflammation has subsided; they are always remedies which require some caution in their management. In chronic pleurisy it frequently becomes a question whether the operation of paracentesis should be practised. This is, as is well known, one of the most simple operations in surgery, and no one can meet with the least difficulty in performing it,—but, at the same time, it is often very serious in its consequences. There is a rule in surgery which is here strictly applicable; that is, that the exposure of a large suppurating cavity to the air, necessarily excites hectic fever, and sometimes favours the development of secondary abscesses. The chances of recovery are not, therefore, on the whole increased by the operation, and it is one which we should not perform, unless it be to relieve excessive dyspnœa, which may in itself be severe enough to threaten life.

If it be thought advisable, extreme care should be taken to prevent the entrance of the air. The plan proposed by M. Raciborski might be tried.

LATENT PLEURISY.

This is another variety of the disease: like all latent inflammations, it is not indicated by the usual functional signs. These are in pleurisy, pain, cough, dyspnœa, and fever, all of which may be either wanting, or so obscure as scarcely to attract notice.

When the disease is slight and latent, it passes through its stages without notice, and the patient usually forgets the trifling indisposition under which he may have laboured; it is in this way that adhesions are so frequently found in the pleuræ of persons who have no recollection of the symptoms of the previous inflammation. When the latent pleurisy is more severe, it gives rise to more decided symptoms; but these are very slow in their progress and formation, and increase very gradually, producing a disturbance of the general system, attended with slow wasting of strength and slight fever, rather than with any symptoms which point decidedly to the local inflammation. A disease which begins in this way is necessarily an obscure one, and may imperceptibly attain a degree of severity which will either render it fatal of itself, or as is much more frequent, give rise to other disorders, especially of the tuberculous kind. Indeed, many cases of tuberculous pleurisy are in their nature more or less latent; for the peculiarity of latent pleurisy consists merely in the absence of the ordinary local signs; it may or may not be complicated with tubercles. When these are found in pleurisy, the symptoms are generally less distinct than in the ordinary varieties, but not in other respects very different.

The diagnosis of latent pleurisy is of course more difficult than that of any other variety of the disease. It depends upon the physical signs of the local mischief, and the evidence of general disorder of the economy. When the disease is attended, as it often is, with considerable effusion, there can be no difficulty in deciding as to its nature, provided all the physical signs can be detected; that is, the dull or flat percussion, feeble respiration, and egophony: if the friction sound be present, it is of course still more evident. But if the signs be limited to the mere feebleness of respiration and dulness of percussion, we must take care not to confound the disease with an enlargement of the liver, or a chronic consolidation of the lung. As a general rule, however, the physical signs of latent pleurisy are tolerably well marked in all severe cases, when we compare them with those constitutional symptoms which are commonly caused by the disease. These generally pursue the following order:—a patient previously in good or passable health is taken

with a slight or sometimes a severe chill, which is sometimes so short that he is scarcely conscious of its occurrence; this is followed by a slight fever, increasing a little towards the close of the day, but rarely severe enough to destroy the appetite; this is, however, a little diminished, whilst the thirst and dryness of the skin are rather increased. There is often a slight hacking cough, but the expectoration is altogether or nearly wanting. The strength of the patient is a little enfeebled, but not enough to prevent him from attending to his ordinary business. These symptoms are so slight that most patients are totally unable to localize their disease; this is indeed so difficult that I have known several experienced physicians, who were labouring under this affection, without being able to make a positive diagnosis in their own case.

If we remember, therefore, that latent pleurisy is rarely important, unless it be discoverable by the physical signs,—for in no other case does the effusion take place to any great extent,—we will rarely meet with much difficulty in recognising the disease. The common source of error is in distinguishing between it and pulmonary phthisis, which is sometimes excessively difficult, for the one may often be complicated with the other. This is particularly true of tuberculous pleurisy, in which there is an actual deposit of tubercles, either in the pleuræ or the lungs, and yet the ordinary symptoms of pleurisy are present. As this subject rather belongs to phthisis than proper pleurisy, I do not wish at present to enter more at length into this matter. It is one of those things which are most difficult to describe: the diagnosis depends upon a number of circumstances, which, in themselves, are unimportant, and acquire value only from their combination.

The prognosis of this form does not differ from that of other varieties of the same disease,—that is, of those which are equally chronic; and except in the cases in which the disease passes into the tuberculous form, it generally terminates favourably: if it be long neglected, however, the disease is sooner or later transformed into pulmonary phthisis.

The treatment of latent pleurisy does not differ in any respect from that of the ordinary chronic forms; and I need not, there-

fore, repeat what I have already sufficiently entered into. The treatment is continued until all physical signs of the disease are passed away, and the general healthy appearance of the patient is entirely restored.

SECONDARY AND COMPLICATED PLEURISY.

Pleurisy is secondary to many other diseases: these may be either the affections of the lungs proper, or of the economy in general. When pleurisy occurs during the course of a disease of the lungs, it is most apt to develop itself when the external portions which are nearest to the serous membranes are affected: thus, pneumonia, gangrene, and phthisis, which are the diseases most frequently followed by pleurisy, are often not complicated with it until the disease has advanced from the central parts of the lung, where they generally begin, to the surface; hence the pleuritic stitch or pain may not be felt until a comparatively late period. As a general rule, all affections of the lungs which approach the pleura will give rise to pleurisy, which is the surest safeguard against perforation of the pleura.

These cases of secondary pleurisy are generally classed with the diseases of the parenchyma with which they are connected; for these are much more important disorders. The treatment is especially directed towards the pleurisy only so far as it is designed to remove pain. In other respects the same mode of treatment which is proper for the removal of the inflammation of the parenchyma will usually relieve the disease of the serous membrane. The serous inflammation may occasionally prove more severe than the parenchymatous disorder; thus, there may be but little disease of the substance of the lung, and rather a large effusion into the pleura: this variety is then called pleuro-pneumonia, and it becomes very little else than a pleurisy aggravated by the pulmonary disease.

The tuberculous pleurisy is a disease of some importance: in certain cases it is consecutive to the tuberculous deposit in the parenchyma of the lungs, and is then strictly secondary; in another class of cases the tuberculous deposit takes place in the

pleura, and is followed by the inflammation; and in a third the inflammation occurs in an individual who is previously in good health, or at least free from evident tuberculous disease of the lungs, which does not occur until the inflammation has taken place. The first two varieties belong exclusively to the subject of pulmonary phthisis; the latter is rather a cause than a consequence of it,—hence it merits some notice in this place.

The third class I would divide into two sub-divisions,—in one of them the tuberculous disease of the lungs occurs after the pleurisy has lasted for some time, or the effusion has perhaps been partially or entirely absorbed. It is difficult to say why a simple pleurisy should be more frequently followed by tubercles than pneumonia, yet such is the fact; or at least there are many cases of pleurisy in which neither attentive observation nor careful reasoning can lead us to suspect the occurrence of tuberculous disease during the active period of the inflammation, although it is developed in its declining stage or at its close. If I were to hazard a theory, I should say that the singular analogy between the irritative fever from pleuritic inflammation with purulent effusion and that resulting from the acute tuberculous disease, shows that there is a close alliance between the two kinds of morbid action. This explanation, however, even if its correctness were perfectly proved, does not entirely solve the difficulty; but it is certain that the very different ways in which tubercles accompany pleurisy, prove that the mere absorption of pus will not account for it in a large proportion of cases, although the transmission of the purulent fluid through the system must be more or less deleterious, and, like all enfeebling agents, it will break up the constitution, and favour tuberculous diseases.

The second mode in which tubercles seem to arise from pleurisy is probably rather more frequent than that which I have just described; the pleuritic inflammation occurs in healthy individuals, or those who are apparently healthy; and in the serous membrane, as well as in the coating of coagulable lymph or false membrane, we find a great number of minute granulations of various size—some barely visible, others of the diameter of half a line or a line—each surrounded by a beautiful net-work of vessels passing to them. The granulations are, as a general

rule, most numerous where the vessels are most developed, although this is not invariably the case. In this variety it would be an abuse of reasoning to conclude that the tuberculous granulations had existed in a latent state, and were followed by the serous inflammation; for they are, for the most part, equal in size, and evidently of extremely recent origin, some of them often appearing in the false membranes, which are necessarily consecutive to the pleurisy. There is, of course, something besides the pleurisy; for all cases of inflammation do not give rise to tubercles, although the exciting causes of the disease, when complicated with them, are the same as of ordinary inflammations. This variety of pleurisy has been little noticed by writers; indeed, we will not, I believe, find that its true value as a cause of tuberculous disease of the parenchyma of the lungs is anywhere pointed out.

The varieties of tuberculous pleurisy which are consecutive to pulmonary phthisis, belong more properly to the history of the latter disease than to that of pleurisy proper. The other anomalous products which occasionally take place in the lungs are often complicated with pleurisy; and in a few rare cases we shall find that the cancerous or melanotic substance is secreted simultaneously with the serous inflammation: this disease is similar in many respects to tuberculous pleurisy, but possesses little or no practical interest.

CHAPTER VII.

BRONCHITIS — ACUTE VARIETIES — SIGNS AND TREATMENT OF ACUTE VARIETIES—BRONCHITIS OF THE OLD—CHRONIC VARIETIES—PECULIAR VARIETIES.

Having concluded the subject of pleurisy in its various forms, I might now pass to that of pneumothorax, as in this affection the same membranes are involved; but inasmuch as bronchitis is of more frequent occurrence, and, like pleurisy, in very many cases complicates or gives rise to affections of the parenchyma of the lungs, I think it comes in very well in this place, and I shall therefore now proceed to treat of this disease. The term *bronchitis* is, in common parlance, applied to various affections of the respiratory organs, as laryngitis, several affections of the lungs, &c.; but it should never be used in this way by physicians, as it is vague and unphilosophical. The term should be confined to inflammation of the mucous membrane of the bronchial tubes.

Bronchitis, like all other inflammations, is divided into *acute* and *chronic*. The acute has been subdivided in reference to the greater or less quantity of the secretion, and its epidemic or sporadic nature. The first division is of very little importance; but the second is well founded, as the disease is much more serious when it occurs in an epidemic form. In the epidemic bronchitis, to which the name influenza has been given, the severity of the constitutional symptoms is by no means proportioned to the intensity of the local lesion,—the latter in many cases being very slight, while the former are sufficient to confine the patient to his bed for several days. The constitutional symptoms are pains in the back, &c., high fever, and extreme prostration.

We have no opportunities of examining the anatomical lesions

in simple acute bronchitis, as the disease is seldom or never fatal. On this account we can only study them in cases in which it is secondary to other grave diseases, and in these cases we often meet with every stage of bronchitis. In this disease the mucous membrane itself is chiefly involved, and not the subjacent tissue, as is the case in serous inflammations. The lesions observed are injection of the mucous membrane, ecchymosis, thickening, and induration. The last-mentioned lesions may perhaps occur in primary acute bronchitis, although it cannot be demonstrated; but in cases where the affection is secondary to some other disease we frequently meet with it. The lesions are found to be more marked in the minute than in the large bronchial tubes, although the signs of inflammation of the larger tubes may have been very decided before death.

In anemic patients the mucous membrane, instead of presenting increased redness, is found to be pale; the only change which is perceived is that the membrane becomes more opaque, while in a healthy state it is almost transparent. This appearance is not at all uncommon in persons whose blood is deficient in red globules at the time of the occurrence of the affection.

In acute bronchitis ulceration rarely takes place, although it is by no means infrequent in the chronic form of the disease. In the more acute variety it is almost entirely confined to those cases which have a specific character, such as bronchitis, complicating rubeola and variola. In these cases the ulcers are at first confined to the follicles, although they sometimes extend themselves until these acquire an irregular outline, involving the surrounding membranes. Ulceration affects principally the trachea and larger tubes, where the follicles are well developed, and rarely extends to the minuter ramifications of the bronchial tree. I shall not dwell upon this lesion at present, as it does not deserve much attention in this place. There is, however, another modification of much more importance, viz., the effusion of lymph and formation of false membrane. This form of inflammation which has been termed diphtheritis, occurs also in severe cases of croup. It is not met with in the usual forms of the disease, but occurs chiefly at particular seasons and in certain localities.

When bronchitis commences in the small tubes, and extends upwards towards the larynx, it is sometimes though not frequently fatal; but when it follows the opposite course, beginning at the larynx, and extending downwards, it may be arrested, and the disease will almost always terminate favourably. Inflammation of the bronchial mucous membrane is in some cases attended with a serous effusion, which, occurring under the membrane, gives rise to œdema: when this takes place in the upper portion of the larynx, it constitutes œdema of the glottis. Bronchitis tends, in most cases, to get well without the formation of pure pus. Its progress is as follows: at the commencement of the inflammation the membrane is injected and thickened, and its secretion is arrested. An increased secretion then takes place, which is intended by nature to relieve the turgescence of the vessels: if the inflammation continues the secretion then becomes opaque; if it be not arrested at this stage, but still goes on, purulent globules are mixed with the mucus, and in more protracted cases pure pus is secreted. The expectoration, however, is never found to consist of pus alone, because, although certain parts of the membrane secrete a notable quantity of this liquid, yet before it is expectorated it is mixed with mucus from other portions.

Bronchitis may occur as a primary disease, or as secondary to some other affection of the lungs. When it occurs as a primary affection, it may either terminate in perfect recovery or may give rise to the development of some lesion of the parenchyma of the lungs, such as pneumonia or phthisis. The former is the more common termination, but the latter is not unfrequent.

In other cases the bronchitis supervenes on one of these affections, which may promote it, or rather may involve the bronchial tubes with the parenchyma. This distinction is of the greatest importance in forming a prognosis; for when the disease is secondary it is merely a part of the tuberculous disease; when it precedes this affection it may proceed to a certain length, and the tubercles may then be arrested.

We now come to the signs which indicate acute bronchitis. These may be divided into *general* and *local*. The general

signs are febrile excitement, with its attendant symptoms of enfeebled strength. The local signs are cough, expectoration, soreness of the chest, with the physical changes in the respiratory sound. In treating of the local signs, I shall first consider those connected with obstructions to the passage of air through the tubes. The sonorous rhonchus is generally heard in the first stage of acute bronchitis: it is produced by the thickening of the mucous membrane of the larger portions of the tubes, which contracts their caliber, and thus impedes the passage of air through them. I described this rhonchus in a previous chapter, and pointed out its distinctive characters. As it often occurs first at the root of the lungs, where bronchial respiration is loudest in pneumonia, we may, without we are attentive to the distinctive characters which I laid down, mistake it for the latter sound: it is important to bear this in mind. The sonorous rhonchus is heard in the larger tubes; but when the inflammation extends to the smaller tubes, a sibilant rhonchus is produced, which is caused by the same physical condition as the sonorous, but differs from it on account of the smaller caliber of the tubes in which it occurs.

Although these rhonchi are very frequent, yet if we expect to meet with them in all cases of acute bronchitis we will be egregiously mistaken, because the thickening must reach a certain point before the sound is developed, and therefore if it does not proceed thus far no rhonchus will be heard. Feebleness of respiration is a more constant sign in bronchitis: it results from the air not passing freely through the tubes; but, like the rhonchi themselves, this sign is extremely variable, shifting from one portion of the lung to another, as it is temporarily influenced by the efforts of breathing, which force the air into the lungs, and for a time clear the tubes. In this affection the chest sounds perfectly clear on percussion in the first stage; it, however, becomes somewhat dull in the second, but the alteration is very slight.

In the second stage of the disease secretion takes place into the bronchial tubes, which gives rise to the moist rhonchi, mucous and sub-crepitant. The former, like the sonorous rhonchus, is produced in the larger bronchial tubes,—the latter in

the smaller. The mucous rhonchus is not, however, constant, but it appears and disappears in various portions of the lung, even after the patient expectorates freely; and in the slighter attacks of the disease it will scarcely be heard, and only at the close of the disease, after secretion has fairly commenced. In some cases in which there is an abundant secretion the moist rhonchi, both mucous and sub-crepitant, are almost always permanent, and they usually extend through the whole or a great part of the lungs, although most abundant at the lower part, never ceasing entirely, notwithstanding the patient has expectorated with some facility. The sub-crepitant rhonchus resembles very much the crepitant, which is peculiar to pneumonia: this renders the diagnosis somewhat difficult, as the cases in which it occurs simulate very much. When, however, the bronchitis is of considerable extent, it does not resemble pneumonia so closely; for the latter disease scarcely ever extends to a large portion of both lungs, as is often the case with bronchitis.

After the secretion from the mucous membrane occurs, the mucous membrane becomes less thickened, so that the dry rhonchi quickly diminish, and the respiration gradually returns to the normal state: but for a time it may be more or less mixed with moist rhonchi; that is, the mucous and sub-crepitant. These gradually cease as the resolution of the disease advances.

The expectoration in acute bronchitis is very variable: at first, as the cough is dry, there is little or no expectoration; but as the disease advances towards resolution, or passes into a more chronic variety, the expectoration becomes much more abundant, and consists of sputa which are almost peculiar to this disease. When the disease is still slight, or if it remain stationary, the sputa are generally transparent, and consist merely of thin mucus. As soon as it tends decidedly towards resolution, or if, instead of tending towards resolution, it assumes a sub-acute form, and becomes chronic, the character of the sputa changes, —they become more thick and opaque, and of a whitish colour. If the disease be very intense, a small quantity of purulent matter is sometimes mixed with the sputa, and they assume the

muco-purulent character. In these cases their form is irregular, and the thicker portion is generally diffused in irregular shreds through the thinner part. As the disease declines the sputa gradually become less and less abundant, and lose their purulent appearance, being converted into simple mucus. If the inflammation be very violent, the secretion from the bronchial tubes becomes almost of the consistence of coagulable lymph, and is firm, and moulded into the form of the bronchial tubes; these tubes, or polypi, as they are sometimes called, indicate a high degree of inflammatory action.

The symptoms of primary acute bronchitis differ but little from those of other forms of the disease, such as the chronic, &c., but the general signs are somewhat different,—they are generally very well developed in epidemic cases, and are very slight in the sporadic. The patient is first taken with a chill, which is followed by febrile excitement, thus resembling other inflammations, as well those of serous membranes and of the substance of the lungs, although it is of much less intensity. The patient, then, has slight fever, and sensations of chilliness occurring at different times, restlessness, heat in the palms of the hands, &c. The condition of the pulse is in perfect correspondence with the moderate fever, rarely exceeding eighty or ninety in the minute. In epidemic bronchitis the condition of the patient may be very different; the pulse is often small, compressible, and frequent; there is great prostration and disturbance of the nervous system; and, consequently, the tolerance of loss of blood is much less than in serous inflammations. There are other symptoms depending upon the febrile excitement, such as anorexia, thirst, and headache.

There is another set of symptoms which is secondary, and belongs to affections of the other tissues, principally the serous: of these the inflammation of the pleura is the most common, producing pain, which is increased during the act of inspiration. The pleurisy which sometimes though rarely supervenes upon, or complicates bronchitis, is very slight, and is usually dry; when the pleurisy is considerable it is looked upon as a primary disease, of which the bronchitis is a complication. This accidental pleurisy may prove a cause of death in certain cases; when, for

instance, there is hypertrophy of the heart, or when the patient is loaded with fat, it produces this catastrophe by increasing the dyspnœa which usually attends bronchitis, when it attacks the same individuals. The danger in these cases arises chiefly from the pain which impedes the respiration: in simple bronchitis the pain is slight, and often limited to a mere soreness.

Acute bronchitis generally lasts but a few days, and its termination is in most cases favourable. It sometimes, however, runs into the chronic form. This may depend upon the peculiar susceptibility of the patient to inflammation of the mucous membrane, or the unfavourable hygienic circumstances in which he is placed. In some cases it leads to the development of tubercles in the lungs; this, most commonly, is owing to a decided tuberculous diathesis of the individual affected with it.

The diagnosis of acute bronchitis is generally quite easy. Beginning, as the disease generally does, as an acute affection, it can only be confounded with pneumonia or pleurisy. In some cases, indeed, bronchitis is merely the commencing stage of the pneumonia, which soon masks it symptoms, and then becomes the principal affection. The distinction between these diseases is to be looked for partly in the expectoration, which is very different, and then in the absence of the characteristic signs of pneumonia,—such as bronchial respiration and crepitant rhonchus. In pneumonia, too, the patient is generally very ill, and obliged to keep his bed, but in bronchitis he is still able to walk about his room, if not to get out of doors. There is sometimes, however, a difficulty in distinguishing cases in which the bronchitis is extensive and is followed by a limited pneumonia, but in these cases the best distinctive marks must be sought in the characteristic physical signs of each of those affections. The distinction between bronchitis and pleurisy is, in general, quite easy,—the symptoms of the two affections, as well as the physical signs, are of course totally different. Phthisis, in some cases, is with difficulty distinguished from bronchitis; much attention must be given to the general symptoms of the two disorders, and the progressive emaciation and the frequency of the pulse will generally point out those cases of phthisis in which the physical signs are not very evident. When there is much

physical obstruction at the summit of the lungs, the case is evidently phthisis, although it may be complicated with catarrh, that is, with slight bronchitis.

The prognosis of bronchitis is, as a general rule, quite favourable; there are, however, exceptions to this rule. These occur chiefly in the aged and in young children. We therefore always feel more uneasiness about the disease when it is seen in an aged person; it is in this class of individuals, however, more dangerous, because it is apt to terminate in pneumonia, than from any immediate symptoms in the acute forms. In young children, the danger depends almost entirely on the same disposition to inflammation of the parenchyma of the lungs. As a general rule we may state, that when the oppression is but moderate, and the expectoration continues to be free, there is little danger with the aged. In children, if we find the respiration continues free, we know that there is but little danger; but when the oppression becomes considerable, the child is almost always on the point of passing into pneumonia, a disease in which the prognosis becomes much less favourable than in ordinary catarrh.

The treatment of bronchitis is simple, and will occupy us but a short time. We find in the books generally, a regular course laid down for the treatment of this affection,—the first step of which is, in severe cases, the abstraction of blood. Bleeding is unquestionably a most useful remedy; but it should not be prescribed for all patients indiscriminately, for the milder cases get well very rapidly without it. We should only resort to it in severe cases, for there are other means by the use of which we may cause the disease to abort. These consist chiefly of the nauseating and stimulant expectorants and diaphoretics. In most cases I prefer the vegetable diaphoretics, aided by hot pediluvia, and generally make use of an infusion of eupatorium and sanguinaria, or eupatorium and seneca.

Ipecacuanha and tartarized antimony produce a decided effect on the disease. The latter is not always well borne, and ought to be used in large doses only in severe cases, as it may cause much irritation of the stomach. I give it usually in very small doses, sometimes in lemonade or neutral mixture, the object not being to excite severe nausea, but to produce a sedative effect.

Dr. Physick has the credit of originating a remedy which was much used in this city some years ago. It consists of tartarized antimony, gr. ij., bitartrate of potassa, ʒij., dissolved in one quart of flax-seed tea, to be taken in divided doses, in the course of twenty-four hours. This remedy is not altogether safe; for if the patient should drink a large quantity of it through mistake, it would probably produce very unpleasant symptoms, as tartarized antimony diffused in a large quantity of any fluid is very apt to bring on violent inflammation of the mucous membrane of the alimentary canal, though the quantity taken be not very large. It may be advantageously combined with opium. Some give a dose of opium alone in the commencement of the affection;—I prefer, however, a combination of this kind, which produces diaphoresis, and often affords very speedy relief. You may give a fourth of a grain of tartarized antimony, with one-sixth of grain of sulphate of morphia, or you may vary this to suit the case.

When the disease does not subside at once after active treatment, the patients generally ask something for their cough. In these cases many cough mixtures are used, most of which are beneficial in their effects. They contain a narcotic, nauseating, or stimulating ingredient, and sometimes a combination of these, commonly mixed with mucilage of gum arabic, which fulfils the indication of allaying the irritation about the throat. A remedy in very general use is the *Brown mixture*, the composition of which every one is well acquainted with. Another common mixture is one of the syrups of seneca and squills, to which opium may be added if necessary; but you should be very cautious about giving opium in mixtures to children, as the accumulated effect of repeated doses may arrest the secretions, and produce other dangerous results. Certain stimulants are frequently given with advantage towards the close of acute cases, and are very useful in the chronic forms of the disease; these are gum ammoniac, balsam of Tolu, balsam of copaiba, &c. The precautions necessary to be observed in convalescence are the same as in other acute diseases. The general indications, therefore, in the treatment of bronchitis, are, if possible, to bring about a cure of the disease by resolution; this rarely takes place without a secretion of mucus from the membrane. Hence, if you prevent

the fever and lochial inflammation from running sufficiently high to impede secretion, either by bloodletting, or nauseating or stimulating diaphoretics, you produce nearly the same effect. After this object is attained the local stimulants which tend towards the lungs favour very much the secretion of mucus, which is almost essential for the removal of the disease.

There are several circumstances which modify this affection to a considerable degree. The most important of these is age, —the bronchitis of children and of old men being very different from this disease as it occurs in adults.

BRONCHITIS OF CHILDREN.

The bronchitis of children is particularly interesting; it extends usually from the trachea down to the tissue proper of the lungs, involving the whole mucous membrane of the large and small bronchial tubes. Its chief peculiarity is its tendency to pass into lobular pneumonia; indeed, if the bronchitis continue for a considerable length of time, this affection is almost certain to supervene. Secretion takes place very early, and consequently the dry rhonchi do not make their appearance, or continue for so short a time that they escape observation: this is another point in which it differs from the affection as it occurs in adults. As the smaller bronchial tubes are usually affected, we almost always find the sub-crepitant rhonchus, which can be heard at all times; for children do not expectorate, but throw off the accumulated secretion by an effort of vomiting or simply swallow it. The chest usually gives a clear sound on percussion, though it is sometimes rendered dull by the accumulation of mucus in the small tubes, and of blood in the tissue of the lungs. These signs are more marked, and more early developed in the right lung, which is more commonly the seat of pneumonia than the left.

Besides the physical signs, we meet with a loose cough, orthopnœa, and flushing of the face; the redness, instead of being circumscribed as in the case of adults, extends over the whole face, and is of a purplish colour, which is to be ascribed to the imper-

fect aëration of the blood. There is also at times great febrile excitement, with cerebral symptoms.

The treatment is also modified by the age. In bronchitis attacking adults, bleeding from the arm is the best means of depletion,—while in children its advantages are very questionable, and it may sometimes be positively injurious. Local depletion is decidedly preferable. Children, who have passed the age of two years, may be treated by general bleeding; but before this age, it should almost never be practised for the cure of bronchitis. I have very rarely found it necessary to bleed an infant suffering with disease of the chest; indeed, in these affections I only bleed as an exception.

Nauseating expectorants are the remedies which have been found most generally beneficial in these affections. Among these, ipecacuanha holds the first rank; this is given in the form of a wine, or, what is still better, a syrup. When much mucus is present in the tubes it is sometimes useful to give it in doses sufficient to produce vomiting, thus favouring the tendency which already exists; by this act the mucus is thrown off, and it is the only way in which children can rid themselves of it, as they cannot expectorate. It is generally, however, used in small doses, which act upon the skin and other secretions without producing much nausea. Antimonial wine is also used in the treatment of this affection, but I prefer the wine of ipecacuanha in the greater number of cases. The former is a more powerful remedy, and in very severe cases more reliance can be placed on it, but it is, on the other hand, more liable to induce inflammation of the mucous membrane of the stomach and intestines. Squills is also a remedy in common use in the pectoral affections of children, and is usually kept in families in the form of syrup. In cases which do not yield at once, we have recourse to other remedies as adjuvants, such as mild sinapisms applied to the chest, legs, and ankles. A very good one is readily prepared by wetting a cloth with vinegar, and sprinkling it with mustard; blisters I do not consider to be so efficacious as the milder stimulants long continued.

Another very important point in the management of this affection is, that the child be not suffered to remain too long on its

back, as this position promotes the development of lobular pneumonia, in consequence of the mucus gravitating to the inferior portion and accumulating in the small tubes, which renders aëration imperfect, and thus favours if it does not produce the congestion of the lung which ends in pneumonia. The child should not be allowed to lie on its back for a longer period than two hours. This direction may appear to be trivial, but it is of much importance, for I have known death to occur from a neglect of this precaution.

As regards the quantity of blood, one or two ounces may be taken from a child under two years of age; as a general rule, an ounce for a year will answer very well. In judging of its immediate effect we must be guided by the paleness of the patient, and not by the pulse. Sometimes a very small loss of blood produces a very decided effect upon children; therefore they should not be leeched or bled except under our immediate inspection, for cases of death from leech-bites, that is when the larger European leech is used, have often occurred among them. Cups are better than leeches, after the child has passed the age of seven years.

BRONCHITIS OF OLD MEN.

The bronchitis from which those advanced in age so frequently suffer, is an affection presenting much variety of form. In the first place, it varies as regards the affected portion of the bronchial tubes. It sometimes attacks the smaller tubes, and then it stimulates pneumonia. Indeed, it is often called peripneumonia notha. The patient suffers excessively from dyspnœa, which is much worse when he already labours under emphysema, or any other disease of the respiratory organs, which of itself occasions a difficulty of breathing. The treatment of this affection varies according to the condition of the individual attacked by it, and the form of the disease which it assumes.

If the patient be robust, and we are called early, we will find it advantageous to resort to pretty free depletion from the arm. Great caution, however, is necessary in the use of this remedy

after the disease has advanced to a certain point. As a general rule I think it best to abstain from bloodletting except at the earlier periods of the disease. When secretion has taken place, and the patient is reduced in flesh and strength, the bleeding often causes dyspnœa by preventing free expectoration. Vegetable emetics, in small doses, and expectorants, especially those of a stimulating nature, are the most valuable remedies in these cases; and in this disease you will again find that the senega is one of the best expectorants of its class. If the patient be weak and debilitated, some carbonate of ammonia must be added to it; but the balsam of copaiba does not answer so well in this variety. If I were to select the diseases in which carbonate of ammonia is decidedly useful, I should place the bronchitis of old men and feeble subjects at the head of the list. The ammonia keeps up the strength of the patient, and promotes the natural process of cure; that is, evacuation from the bronchial mucous membrane. It therefore acts directly upon the affected part; blisters and sinapisms exercise a much more indirect influence upon it, and do good rather as revulsives in removing the inflammation, and as stimulants to the nervous system, than as direct curative agents.

In some cases of bronchitis there is a viscid secretion with deposit of lymph, which causes great dyspnœa on account of the formation of a membrane in the tubes; sometimes this membrane has a tubular form, and these tubes have been ridiculously termed bronchial polypi. This formation I have observed more frequently in old persons than in children. It causes dyspnœa by protecting the mucous membrane of the tubes from the contact of the air, and by obstructing the passage into the air-cells. The lymph is detected by its presence in the expectoration, as well as by the orthopnœa. Emetics and expectorants, as those of a nauseant or stimulant kind, are appropriate to this disease, according as inflammation is present or not; but mercurials, which are the most efficient of all known medicines in preventing the formation of lymph, are sometimes required, if the affection be highly inflammatory.

SECONDARY BRONCHITIS.

Although acute bronchitis is in many cases an idiopathic affection, it also occurs frequently as a complication of other diseases. Almost no acute disease attended with fever is entirely exempt from it; and as a general rule the degree of fever is proportioned to the frequency and severity of the secondary bronchitis. It is thus an almost invariable attendant upon measles, typhoid fever, and in fact many of the exanthematous diseases. The secondary inflammation is most frequent at the same season of the year as the primary bronchitis; that is, in the early spring, and in the winter months, when febrile diseases are peculiarly liable to this complication. There are also many chronic diseases which singularly favour the development of acute bronchitis; these are diseases of the heart and of the lungs. I have already alluded to the connection of this disease with tubercles; this is the variety most difficult of recognition, but scarcely more frequent than the acute bronchitis which occurs during the course of the chronic variety, or in emphysema. In these cases the distress and difficulty of respiration are much greater than in the simple form of the disease.

The treatment of this variety of the disease is similar to that of the acute idiopathic bronchitis, and consists in the use of depletion, stimulants, expectorants, and diaphoretics. After the secretion from the mucous membrane has set in, local depletion may be used according to the necessity of the case. Cups are more beneficial than leeches, as they produce greater irritation with a smaller abstraction of blood; they are generally applied between the scapulæ. Stimulants applied externally often produce a good effect; sinapisms, and other remedies of this kind, are usually placed upon the anterior portion of the thorax. They act as counter-irritants.

CHRONIC BRONCHITIS.

I have still to speak of the chronic and specific varieties of bronchitis, and shall commence with the chronic.

Chronic inflammation of the serous and mucous membranes may originate in two ways: 1st, it may be chronic from its commencement; 2dly, it may follow acute inflammation, which frequently passes into the chronic form. The latter is the more common in the case of bronchitis.

Chronic bronchitis presents several varieties: *the common chronic mucous catarrh; chronic catarrh, with a thin glairy secretion;* and the *dry catarrh*, with thickening of the bronchial mucous membrane. There is another form described by some authors, viz., the *pituitary;* but this is very rarely met with so strongly characterized as to be distinguished from the second variety, or chronic catarrh with a glairy secretion, and therefore it may be considered as a mere modification of it.

The first variety, or the common mucous catarrh, is the most common. It is characterized by a secretion of white mucous, sometimes puriform, generally in irregular shreds, and but rarely moulded to the form of the tubes. It consists of mucus rendered albuminous or purulent in the progress of the inflammation. The febrile excitement in this affection is various, being sometimes very decided, but in a majority of cases comparatively mild. It is usually greater at night than during the day. The appetite, and other constitutional symptoms, vary very much.

The diagnosis is based upon the presence of certain physical and functional symptoms, and the absence of other physical signs which are found in analogous affections of the chest. The positive signs are, in the first place, the rhonchi; these are of the moist variety, and vary very much, the sub-crepitant being heard at one time, and the coarse mucous rhonchus at another. The respiration is sometimes loud and rough, at other times feeble; the latter state is much more common. These are the positive signs. Our diagnosis is rendered certain by the absence of signs which other diseases of the chest always present. Thus, it is distinguished from phthisis by the absence of flatness at the summit of the lungs (as we almost always find is the case in this affection), and of the bronchial or cavernous respiration. Although these signs are absent in the commencement of the affection, we not unfrequently find them supervene after it has con-

tinued a certain time, as chronic bronchitis may often become a precursor of phthisis. This change in the condition of the lungs is shown by constitutional as well as local signs. An increase of febrile excitement takes place, and the patient becomes more emaciated. Emaciation sometimes occurs without the supervention of phthisis; from the alimentary canal being involved, and from the febrile excitement; but this is of rare occurrence, and we scarcely ever meet in our practice with cases in which the diagnosis is rendered obscure on this account. After the tuberculous disease has taken place, it is exceedingly rare that the patient recovers. Sometimes the change that is about to take place seems to be indicated by the constitutional signs before the development of tubercles has occurred, by the febrile excitement, by the other symptoms being decidedly increased, and by a change in the complexion and countenance. This is a time when a correct diagnosis is of very great importance, as a proper plan of treatment may retard or prevent the development of a disease which is almost always fatal.

Treatment.—The treatment of this form of chronic bronchitis is somewhat similar to that pursued in the acute varieties. General bloodletting is not often indicated; but the abstraction of small quantities of blood, by means of cups, often repeated, produces very good results: the cups are usually applied in the axilla, between the scapulæ and under the clavicles. If the disease at any time assumes a more acute form, general bleeding comes in very well. Leeches are sometimes used, but cups are preferable on several accounts; they produce a greater degree of irritation, without so great a loss of blood, and are cheaper and more convenient. Counter-irritants to the chest are very good adjuvants. These are numerous, and various in the degree of irritation they produce. I generally prefer the milder ones, such as Burgundy pitch, croton oil, &c., which being applied over a large surface often produce, I think, a better effect than blisters and tartarized antimony, which must be limited to a comparatively small portion of the chest. Liniments of a stimulating character have been much recommended; these consist of ammoniacal and terebinthinate mixtures. The noted empiric St. John Long, was in the habit of treating tho-

racic diseases solely by applications of this character. Flannel worn next to the skin, and woollen stockings to the feet, are essential as adjuvants.

As internal remedies the stimulant expectorants should be used, except in those cases in which the disease approaches the acute form, when the antiphlogistic and sedative medicines are much more effectual. These are ipecacuanha, tartarized antimony, &c. Of these I prefer the ipecacuanha, as it is much milder in its action, and more easily borne than tartar emetic, which, after it has been employed for a few days, is apt to affect the mucous membrane of the stomach and intestines. In the more chronic cases the balsamic expectorants are employed with great advantage. Of these the balsam of copaiba is the most efficient, but it is a very disagreeable remedy, and cannot be taken by persons who are at all dyspeptic. The success in the employment of the remedy with patients of this class depends very much upon our mode of administering it. The following formula is a very good one:

℞.	Balsam Copaibæ	ʒj vel ʒij.	
	Tinct. Cardamom. Comp.	ʒii.	
	Gum. Acac.	q. s.	
	Aq. Menth.	℥vss.	M.

We should commence with half a drachm of the balsam in 24 hours, which quantity is to be gradually increased up to one or two drachms in the same period. If it produces much purging after administering it for some days its use must be stopped, as this is an evidence that it has made an impression on the system, or we may sometimes arrest this by adding a few drops of laudanum to this mixture. This remedy is only to be resorted to when others have proved ineffectual, as it is exceedingly disagreeable to the patient. There are other remedies of a milder nature, which can be taken with more facility; they are generally given in the form of syrups or lozenges. Most persons prefer the former, as they have been accustomed to the use of cough mixtures, which are generally in the form of syrup. Syrup of seneka is one of the best in the very chronic cases; syrup of ipecacuanha is also frequently used, and many

prefer a combination of the two, which answers a very good purpose. I often use a combination of seneka and Prunus Virginiana, or seneka and sanguinaria, but more frequently the former. The following formula is one which I generally prescribe:

℞. Senegæ.
Prun. Virgin. } āā ℥ss.
Aq. Bullient. Oj. M.

Macera per horas xij., dein cola et adde saccharum album, q. s.

This quantity may be taken in two days, and in the management of the disease is a most effectual remedy.

Gum ammoniac is a remedy much used by some physicians, and in its action nearly resembles the balsam of copaiba. Assafœtida is also an excellent expectorant, but its taste is objectionable to many adults; it may be given in the form of lac assafœtidæ. For children it is peculiarly adapted.

Opium, as a remedy in bronchitis, has many advocates, and it is certainly very beneficial in some cases; but I am very cautious as regards its employment in those affections for the relief of which a secretion is necessary. I only use it as a means of procuring sleep when the cough is troublesome at night, especially when there is much irritation about the trachea and larynx.

If we prefer the form of lozenges, one of the best prescripsions will be that of the balsam of *Tolu*, which may be made up with the proper materials into lozenges, each containing from half a grain to a grain of ipecacuanha, to which a small portion of morphine may be added if necessary.

The next point in the treatment is the hygienic condition under which the patient should be placed. And here the question occurs, should the patient be confined to the house or not? I would not, as a general rule, enjoin this upon him; but where there is a certain degree of acuteness in the symptoms I think it necessary. In other cases he would lose much by keeping within doors in mild and pleasant weather, although during the cool, damp weather which is common in the spring, he should by no means expose himself. We should therefore direct our

patients to take gentle exercise in the open air in good weather, unless he should find it to disagree with him.

A sea voyage to a warmer climate will often remove a bronchitis of long-standing; but it is often very inconvenient for the patient, and in many cases it is not in his power to try it. In proportion as the disease becomes more and more chronic, the patient may increase the amount of exercise, and endeavour to stimulate the muscles and the skin, and thus produce a general but mild revulsion from the interior organs. This treatment is not only of great service in removing the bronchitis, but it is the best means of obviating the danger of pulmonary phthisis. The rules as to clothing and warmth are obvious enough; the great secret of the treatment consists in diffusing the action and nutrition throughout the muscular and tegumentary tissues, and thus giving to the bronchial mucous membrane an opportunity of regaining its normal condition. The medicinal treatment is more complex; but if we separate it from the hygienic management, it will be found to be less efficacious than the latter.

The second variety of chronic bronchitis resembles, in some respects, the *pituitary* catarrh of Laennec. It is distinguished from the preceding by several peculiarities. It does not usually follow the acute affection, but commences with its peculiar characteristics. It generally occurs at irregular periods; but in many individuals it takes place at regular seasons: in this climate usually at the close of the summer, about the month of August. It is quite frequent too in Great Britain.

The local signs of this affection consist of the various rhonchi, both dry and moist, the latter being found usually at the lower part of the chest, the former in the upper portion; there is, however, a predominance of the moist rhonchi over the dry, and of the sibilant and sub-crepitant over the coarser varieties, as the smaller tubes are more affected than the larger. Sometimes all the rhonchi are heard at once, and produce a singular confusion of sounds, to which Laennec has applied the term *omnium avium cantus*. In some cases the air cells are dilated, which renders the respiration feeble, and gives rise to much dyspnœa, resembling asthma, and indeed it may be set

down as one of the varieties of this disease. The dyspnœa complicating the affection, however, more frequently arises from thickening of the tubes preventing the passage of the air into the vesicles. These attacks of dyspnœa are sometimes permanent, sometimes transitory. The fever attending this variety of bronchitis is very slight, and there is very little emaciation.

When this disorder assumes a periodical character, and occurs at a particular period, it lasts several weeks, and in general cannot be cut short by treatment. The duration of this variety of the disease is less than that which occurs at irregular intervals, and it resembles in many respects the more ordinary forms of acute catarrh, but is much more intractible.

Treatment.—Bleeding in a majority of cases is not well borne; but when the symptoms are acute it may be prescribed with advantage. The remedies to be used are those which are calculated to relieve the dyspnœa. These are principally the nauseating expectorants, of which I think lobelia to be decidedly the best, given so as to produce slight nausea; it thus favours secretion and expectoration. Balsam of copaiba is also a very good remedy; but the same objections apply here as in the other forms of bronchitis. Venitian turpentine has been very much used, and is an excellent remedy.

In the periodical form of the affection, after the paroxysm has commenced, no treatment has yet succeeded in cutting it short. There is, however, one point which demands our attention, viz., the prevention of the occurrence of the paroxysm. In one case for which I prescribed cold affusions and the exhibition of quinine, previously to the attack, the disease appeared much later than usual, was milder in its character, and its duration was much less.

Dry Catarrh.—The third variety is perhaps as frequent as either of the others, and is by a strange contradiction in terms called *dry catarrh*, because there is little or no expectoration—differing in this respect from the other varieties. The prominent lesion in this form of bronchitis is a thickening of the mucous membrane. This, though rendered evident by the local signs, is not always found after death: in this respect it is analogous to other congestions of the mucous membranes. It is attended with

very little febrile excitement; and the functions of the alimentary canal are but slightly if at all impaired. The cough is short and dry, thus differing from the cough which attends the other varieties, the latter being loose. The chest is sonorous throughout, and in some cases preternaturally so, on account of the emphysema, which is a frequent attendant. The respiration is generally feeble, and sometimes a rough, rustling sound is heard, arising from friction of the air-cells against the pleura. The dry rhonchi are usually heard, though not in all cases, as the thickening must proceed to a certain point in order to produce them; they, of course, vary according to the particular part of the bronchial tube which is affected. But it generally occurs that the sibilant rhonchus is chiefly confined to the anterior part of the chest, and the sonorous rhonchus to the neighbourhood of the larger tubes. Besides emphysema, there is another complication which is frequently met with, and which, like it, is produced by the violent efforts made in coughing,—I allude to hypertrophy and dilatation of the heart. These three affections frequently coincide; and the heart disease, the dry catarrh, and emphysema, form a triple lesion. The duration of this variety of chronic bronchitis is greater than that of the other two. It continues to an indefinite period,—the patient often labouring under it for several years, unless some acute affection of the lungs should supervene, which is then rendered more grave by the previous existence of the dry catarrh. When, for instance, pneumonia attacks a person who is affected with dry catarrh, the dyspnœa which, under ordinary circumstances, attends the acute affection, is rendered more severe by the existence of the chronic: this, of course, renders our prognosis much more unfavourable than it is when the disease is not complicated with an acute inflammation, or when the dyspnœa is not severe.

Treatment.—Very little advantage results, I think, from the employment of medicines in this variety of chronic bronchitis. It is, however, of importance to attend to the hygienic condition of the patient. His clothing should be warm, and his chest and extremities protected by flannel; and he should not expose himself in damp and inclement weather, while he should take exercise when the weather is dry and pleasant. The patient, however,

sometimes insists upon having medicine, and it is as well to gratify him in this respect. The balsams and turpentines have been much used; also alkalies, which are highly recommended by Laennec.

I have not spoken of the use of mercurials in the treatment of chronic bronchitis. They have been used from time to time; but the results have not been such as, in my mind, to warrant their employment.

There is an affection which resembles very much the dry catarrh, that is, the cough which occurs in some cases of dyspepsia; it is usually dry, and sometimes attended with rhonchi, although in general they are not heard. The diagnosis here depends upon our knowledge of the previous affection of the stomach. In other cases, however, a bronchitis previously existing is aggravated by the occurrence of an affection of the stomach: here the priority of symptoms must be your guide. We can generally succeed in arresting this cough by the use of tonics, alkalies, and other remedies adapted to the state of the stomach.

Chronic bronchitis may arise from a variety of causes, as a fever, an acute attack of disease of the lungs, &c. It is frequently found co-existing with tubercuIous phthisis, which may either have preceded or followed it; and it may follow any other disease of the lungs, or it may be the cause of such affection. Indeed, we seldom meet with a disease of the parenchyma of the lungs unaccompanied by bronchitis, which we might naturally suppose would be the case, since the bronchial tubes constitute so large a portion of the respiratory organs. The disease receives the name of *bronchitis* when the affection is confined to the tubes; but when the parenchyma is attacked, the bronchitis is looked upon as a mere complication of the more serious affections, and the designation of the disease accords with the principal lesion. This rule should be adhered to, otherwise you will confound together many different affections, and may include phthisis, laryngitis, and pneumonia, under the common designation of bronchitis.

PECULIAR VARIETIES.

Besides the modifications of bronchitis which depend upon

the duration of the disease, and the age or other peculiarities of the individual, there are other varieties which are specific in their character, and depend upon a peculiar condition of the system, produced by a constitutional disorder. Of these varieties one of the most frequent is *pertussis*, or *whooping-cough*. This is an affection of the nervous system accompanied by bronchitis, in which sometimes the one, sometimes the other predominates; the affection of the nervous system being in some cases very severe, with but little cough, whereas the cough is frequently very bad, with comparatively slight nervous symptoms. We almost always meet with this disease in children, though adults are occasionally attacked by it. It is a self-limited disease, and therefore cannot be cut short by treatment, although its complications may be removed or palliated. Though the inflammation of the bronchial tubes is merely the local part of the disease, yet it is in one sense the most important, for when the disease proves fatal, patients generally die of the bronchitis and its immediate effects. The secretion from the mucous membrane is much greater than in ordinary varieties of bronchitis; and in children it tends constantly to accumulate in the inferior parts of the tubes: they are in this way gradually enlarged until permanent dilatation results. The thickening and congestion of the mucous membrane do not differ from the same alterations in ordinary bronchitis. When a fatal termination occurs, it generally arises from the feebleness of the patient, and a consequent inability to expectorate, or as is the case with children, to discharge the secretions by vomiting. The parenchyma of the lungs may in this variety become congested and inflamed, and produce a pneumonia which may prove fatal.

The principal sign of this disease is the peculiar whooping character of the inspiration: this is preceded, and in a great degree caused, by the forcible expulsion of air from the chest, in fits of coughing, and it sometimes occurs in other forms of bronchitis, which, however, do not often possess the paroxysmal character of pertussis. In addition to the cough we meet with the rhonchi, both dry and moist, sometimes with a gurgling caused by the collection of fluid in the dilated bronchi. That is, the mucous, the sub-crepitant and the sonorous rhonchi, are generally heard at one and the

same time. The cough usually lasts for several weeks; it then declines by degrees, and the rhonchi disappear. It is gradual in its attacks, being at first slight, and then becoming violent. It comes on in paroxysms, of which, in mild cases, there are usually five or six during the day, the patient being free from cough in the interval. In severe cases the number of paroxysms is much greater. They sometimes occur as often as once an hour, and occasionally there is only an interval of a few minutes. In such cases the patient generally dies of exhaustion. The secretion in the bronchial tubes consists of thick, glairy mucus; when it has continued for a long time it sometimes contains a small portion of pus, intermixed with blood. Sometimes blood is effused, and a partial hemoptysis occurs. The secretion is usually thrown off by vomiting, especially in young children who cannot expectorate. The appearance of the face in this disease is peculiar, being of a bluish colour, accompanied by puffing of the eyelids. This is the effect of the violent efforts made in coughing, and the congestion consequent upon them. It is in some degree a measure of the severity of the affection.

When fever occurs it indicates the existence of inflammation of the lungs, and when high it is a symptom of much gravity. When the development of tubercles takes place towards the close of the disease the fever continues, with a quick, irritable pulse. It is usually the miliary form of tubercles which occurs under these circumstances, and is almost always fatal.

The *diagnosis* is pretty clear after the second week; the paroxysmal character of the cough, with its whooping inspiration, its complete intermission, and the recurrence of the paroxysm during any disturbance of the mind, are sufficient to characterize it.

The *prognosis* is generally favourable in the simple forms of the disease, but becomes less so in proportion to the severity of the complications.

Treatment.—As the disease cannot, as a general rule, be arrested, we should palliate its symptoms, and assist nature in the means which she has pointed out for its relief; we should therefore promote the secretion in the tubes, and favour its re-

moval. For this object we should employ mild vegetable emetics, which tend to bring about both these ends. They should be given once or twice a-day for a week or two. In this affection there is always a disposition to vomit; and as this action, brought on by artificial means, is milder than when it occurs spontaneously, emetics afford very great relief. After this treatment has been continued for the time above specified, we should make use of remedies whose action is slower but analogous to that of emetics, for this is the means pointed out by nature for the cure of the disease; and it is a maxim in therapeutics, that when a secretion is intended by nature to remove any diseased state of the economy we should favour or moderate it, and not arrest it. Ipecacuanha, in the usual expectorant doses, may be used for this purpose, and answers very well; but one of the best remedies in this affection is assafœtida, as it favours expectoration, and also controls the disorder of the nervous system, which constitutes so large a part of the disease. It may be given to children of eight or ten years, in doses of two or three grains, increased to four or five, several times daily. However, it cannot always be given internally, as it is so repulsive to the senses; applied externally in the form of a plaster it acts very well, producing an impression on the nervous system, and moderating the paroxysms. Ammoniac, galbanum, &c., are used in the same manner. Revulsives to the chest are useful, but not always necessary; when required, I prefer sinapisms to blisters or moxas. There is another remedy which is much more powerful than these,—that is, the extract of belladonna; this must of course be used in very minute doses. Still, we cannot be too cautious in the administration of this medicine, which is certainly always attended with some risk. The success which attends its administration in whooping cough is stated to be greater than any other remedy.

The clothing should be warm, and flannel should always be worn around the chest.

The complications are various affections of the lungs, which when very acute are to be treated by general and local bloodletting, and other remedies required in the affections occurring idiopathically. Phthisis occurs as a sequela of this disease, and

does not require medication; it is best treated by a change of air, which is advantageous in the declining stages of all severe cases of pertussis.

As pertussis rarely occurs with adults, we are apt to make an incorrect diagnosis when it does thus occur; this should be borne in mind, as we might confound it with a variety of bronchitis resembling pertussis, which is exceedingly difficult to get rid of. Ordinary bronchitis may be complicated with the nervous spasm; but the disease should not be confounded with pertussis, unless the spasms are disproportioned to the bronchial affection. This constitutes the peculiarity of the disease, and gives to it a mysterious difference between it and other varieties of bronchial inflammation.

BRONCHITIS DEPENDENT UPON A CONSTITUTIONAL TAINT.

There are certain cases of bronchitis which depend on a particular diathesis, or a peculiar condition of the system, induced by a specific affection; to this class belong the syphilitic and scrofulous bronchitis. But you will sometimes find that the syphilitic variety is singularly similar to phthisis in the emaciation and other constitutional symptoms; so much so that the deterioration of the health is such as to end in phthisis. The scrofulous bronchitis is attended with a very abundant secretion of a thick, glairy mucus, and is in most cases complicated with an inflammation of the upper portion of the respiratory tubes, so that the nasal cavities are sometimes more affected than the bronchi; it must be treated with remedies calculated to correct the morbid state of the system, such as mercury, iodine, sarsaparilla for the syphilitic variety: iodine, iodide of iron, and other chalybeates, may be used in the scrofulous varieties of the disease, besides resorting to local remedies.

General remarks.—Although bronchitis, as a disease, presents many varied characters, yet there are certain features which are common to every form of it. In all, the turgescence of the bronchial mucous membrane with blood gives rise to the chief difficulties in the respiration, and when this congestion ex-

tends to the smaller tubes the dyspnœa becomes excessive, and may be a source of immediate danger. This simple congestion of the membrane occurs in the early period of acute cases, and in the dry catarrh it becomes a chronic condition, and lasts for an indefinite period. The most easy and frequent termination of the congestion is by direct secretion from the bronchial tubes; that is by the formation of a mucous and muco-purulent discharge; but in many cases the general circulation may be restored, and the congestion removed, by the free discharge from the capillaries of the skin, or some other tissue. If this relief does not follow, the tendency of all cases of dry bronchitis is to congest the heart, and to distend the vesicles of the lung: hence emphysema of the lungs, and dilatation of the heart frequently depend upon this cause.

The other varieties of bronchitis, whether acute or chronic are those in which secretion takes place; if this secretion be of a natural, healthy kind, the inflammation ceases; thus the thin albuminous secretions are replaced by a more consistent mucous or muco-purulent expectoration, which again gradually passes into a more transparent mucous discharge, which in time ceases. But, although this is the course of the disease when it terminates favourably, in many cases the secretion of mucous and muco-purulent matter will continue, while the inflammation does not abate. These are the chronic cases of mucous catarrh. In this variety the discharge is analogous to what takes place in chronic dysentery, when the inflammation is not relieved by the secretion. The difference appears to arise from a modification in the mucous tissue, by which the vessels remain permanently enlarged, and recover with difficulty, unless a stimulant is administered which should excite this new action. Hence we use what are called the stimulating expectorants so largely in these forms of bronchitis; these remedies supply the excitement necessary to the relief of the disease by a new and more healthful secretion. The inhalation of the vapour of water, of tar, ether, &c., act much in the same way, but are more direct stimulants of the membrane. The depleting remedies, which are often necessary in severe bronchitis, act, of course, very differently from the stimulating expectorants; they merely equalize the circulation of the bron-

chial vessels, and thus lead towards health by removing the vascular excitement which keeps up the disease. The result of this mode of treatment will, of course, be essentially the same with those derived from the stimulating expectorants, but the *modus operandi* is totally different. The revulsive means are more analogous to the directly antiphlogistic remedies, and produce very nearly the same effects.

Bronchitis is therefore a multiform disease, and varies both in symptoms and treatment with almost every modification of the body; it may be highly inflammatory, and require the most vigorous depletory means, or it may degenerate into a mere chronic oozing of the mucus from the vessels. The object of the physician is to vary his treatment according to these different conditions, and at one time to resort to vigorous antiphlogistic measures, and at another to a course of treatment which is totally different. I have laid much stress upon the latter practice because it is suited to a greater number of cases, but I am not the less convinced that in the cases which are decidedly inflammatory the most effectual relief is produced by the depletory practice; it may afterwards be followed by any other remedies that the case may seem to require.

CHAPTER VIII.

DILATATION OF THE BRONCHIAL TUBES.

THERE are two lesions of the bronchi, arising from long-continued bronchitis, which differ very widely, however, in their physical condition, viz., dilatation and contraction of the bronchial tubes. The former of these lesions is by far the more important, and also the more frequent. It prevails in proportion to the number of cases of long-continued chronic bronchitis, with abundant secretions. Acute bronchitis will occasionally produce the same dilatation, provided the mucus be copious, and be expectorated with difficulty after violent efforts of coughing; hence it is not infrequent in pertussis, which is about the only disease of children that gives rise to this lesion.

As dilatation of the bronchial tubes is a mere lesion, which is produced by diseased action, but is in itself of little importance, it must necessarily require less attention than the diseases of the lungs, properly so called: nevertheless, it may be readily confounded with these affections,—and even if it were not liable to this chance of error, there would still remain sufficient reason for studying the symptoms of it. Lesions of this kind should never be confounded with the diseases which give rise to them; but they offer interesting points of relation, and require therefore some attention in order to recogniset hem, and to discover the best means of obviating the mischievous effects which necessarily arise from their occurrence.

Dilatation of the bronchi assumes several different forms: the most frequent is an uniform enlargement of several bronchi of a lobe which, after branching off from the principal trunks, remain nearly of their original size, or even enlarge as they approach the surface of the lung. This variety results very frequently from whooping cough, and the spasmodic bronchitis

which resembles it most nearly. The mucous membrane at the same time is thickened and loses its transparency.

The other varieties, which are less common, are merely partial dilatations in the course of a bronchial tube. There may be only one single enlargement, or several successive dilatations of a large bronchus, which afterwards recovers nearly its natural size. The enlarged portions are thus distinct cavities, and physically speaking, present nearly the same peculiarities as the cavities which arise from the softening of tuberculous matter. There is therefore necessarily cavernous respiration and pectoriloquy, and the condensed pulmonary tissue which surrounds the enlargement may cause a decided dulness on percussion. The condensation of the tissue apparently arises from chronic inflammation, which causes a deposit of new matter in the pulmonary substance. The precise nature of this substance is not ascertained; but it is probably albuminous, like similar deposits in other parts of the body. In the variety in which the bronchial tubes are generally dilated there is rarely cavernous respiration; for the air, in diffusing itself through the lung, does not, of course, present the sharp clear reverberation which is essential to the formation of cavernous respiration. Hence there is very little difference between the respiration in this variety of dilatation, and that heard in the second stage of pneumonia, when the hepatisation occurs around the larger tubes. But in dilatation of the bronchi, the bronchial rhonchi, as the mucous and sub-crepitant, are much more frequent than in pneumonia; and the permanency of the signs in the former alteration, and their rapid changes in the latter, will prevent all danger of confounding the two lesions together. The diagnosis between dilatation of the tubes and phthisis is much more difficult, as it depends not upon the physical signs, which differ but little in the two cases, but upon the progress of the general symptoms. If the symptoms be those of chronic catarrh, that is, if they are attended with severe cough and but slight emaciation, the disease is probably chronic bronchitis; but if the fever and emaciation be much more decided the probabilities are of course greatly in favour of phthisis. Practically speaking the chances of error are very slight; for those cases of chronic cough in which the dilatation of the tubes is

sufficiently great to simulate a tuberculous cavity, are almost always connected with very general bronchitis, in which the signs of a general thickening and inflammation of the mucous membrane are very evident and totally unlike those of a tuberculous disease. There is, however, another variety in which it is impossible to discriminate accurately between these two affections, for the tuberculous disease then coincides with the dilatation of the tubes. In this case the dilated tubes either pass through the masses of tubercle which are deposited at the summit of the lungs, or they terminate as soon as they reach these masses. If the tubercles have advanced to the period of softening, the cavities which are thus produced often communicate directly with the enlarged bronchi, and form as it were a continuous tube. When the dilatation is connected with a cavity it is often preceded by a deposit of tuberculous matter in the bronchus, which is in this way gradually enlarged, and remains dilated after the softening of its contents.

There is, of course, no peculiar treatment for the dilatation of the bronchi; it is strictly a lesion, not a disease, and being placed beyond the reach of the mechanical means of treatment which are adapted to remove an external alteration, it necessarily must remain with the patient. The object of the physician is to remove, as far as possible, the protracted bronchitis which generally produces the dilatation. The lesion then ceases to give rise to much mischief, and even a partial cure may take place.

CHAPTER IX.

EMPHYSEMA OF THE LUNGS—ANATOMICAL CHARACTERS—SYMPTOMS—DIAGNOSIS—PROGNOSIS—TREATMENT.

This is an alteration which is closely analogous with dilatation of the tubes. In fact, it is the same disease attacking a different part of the structure,—that is, the terminating vesicles of the lungs. In their normal state, these cavities are very minute, but may still be discovered by a good eye; but when diseased their size may increase much beyond their natural dimensions, and they then very frequently attain the bigness of a small pea, and in some cases are even much larger. The vesicles, as they enlarge at the same time, become thickened in their parietes, and press upon those adjoining, of which some are atrophied, and others appear to form a direct connection with the distended ones. It is in this way that the very large sacs, of the size of a pigeon's or even a hen's egg, seem to originate, not from a single vesicle, but from the junction of a number of distinct ones, which have gradually broken into each other.

The tissue of the lung which is the seat of the emphysema, becomes pale, and crackles under the pressure of the fingers like a piece of dried lung,—the walls of the vesicles losing their elasticity, and becoming much more rigid. The size of the dilated part of the lung is necessarily increased; hence it presses upon the intercostal spaces, and can no longer be confined in its usual limits. As a necessary consequence of this increase, the walls of the chest are enlarged to an extent corresponding with the distended part of the lungs, so that they form a decided protuberance.

The quantity of blood contained in an emphysematous lung is rather less than natural in those portions of it which are the especial seat of the disease,—that is, the anterior margin of it,—but

the posterior parts contain as much blood as usual, and sometimes become congested on account of the dyspnœa, which is a necessary attendant upon all severe cases of the disease. The congestion frequently passes into pneumonia, and cases which prove fatal for the most part terminate in this way. The mucous membrane of the bronchial tubes is rarely perfectly healthy in emphysema, if it be of severe character. There are two forms of bronchitis which commonly complicate emphysema,—the chronic and the acute. The former is a regular, and almost necessary complication; the latter is often absent during nearly the whole course of the disease, but it is more apt to occur in patients labouring under this disorder than in those who are in the enjoyment of perfect health. When it takes place as a complication, the distress of the patient is vastly greater than in cases of simple bronchial inflammation. The chronic bronchitis which so commonly attends emphysema, is nearly always of the dry variety, or, as it is often termed, it is in fact the dry catarrh. In this case the membrane is permanently thickened to such a degree as to impede the passage of the air, and constantly react upon the disease itself. The bronchitis is then doubly connected with the emphysema, and may be regarded both as cause and effect; either of the disorders may occur first, and will be almost necessarily followed by the other. Chronic dry catarrh produces of itself sufficient dyspnœa to distend the air-cells, and favour the development of emphysema; while if the anatomical condition exists, either as the result of original structure, or of some peculiar cause, the slightest obstruction to the freedom of the respiratory function may cause a severe attack of dyspnœa, and thickening of the bronchial membrane is then almost a necessary result.

Signs.—The physical signs of emphysema are extremely well-marked in severe cases; but, of course, there are many instances in which the alteration deviates so little from the normal standard as to render the signs of doubtful value. When there is much distension the physical signs are all present, and may be referred to the three following heads:—1.—Distension of the portion of the chest. 2. Clearness of sound on percussion. 3. Feebleness of respiratory murmur.

These are the only regular or constant signs, but there are occasionally a number of others perceived. They are sibilant rhonchus, from the frequent complication of dry catarrh, in which this rhonchus is heard along the anterior margin of the lungs; and sub-crepitant, or mucous rhonchus, at the posterior part of the lungs, when they are much congested, or the bronchial tubes are attacked with acute inflammation. There is another sign which is occasionally met with,—the dry sub-crepitant rhonchus, which is nothing but the slight rustling sound produced by the bubbles of air either forcing themselves into the cellular tissue and forming little bags which rub against the pleura, or the dilated vesicles themselves, which are sometimes sufficiently rigid to give rise to some friction and cause a sound.

1. *Dilatation of the Chest.*—This is necessarily most evident in those portions of the thorax where the dilatation of the vesicles is greatest; that is, at the anterior margin of the lungs. The anterior plane of the thorax is rounded, and gradually assumes a convex shape, the most prominent portion of it being near the margin of the sternum: the form of the dilated portion is generally oval, the long diameter of the oval corresponding to the axis of the body: but as the extent of the altered portion of the lung is very variable, the form of the chest differs extremely. The dilatation is more evident in the intercostal spaces than at the level of the ribs, which are but slightly thrown out from the general plane of the body. There is at times a general distension of the chest; the shoulders are then elevated and rounded, and the thorax approaches very nearly to the cylindrical form. This extreme distension takes place only in those who have been long subject to emphysema, especially those who have inherited a predisposition to the disease. In speaking of the dilatation of the chest in emphysema, we must remember that it is moderate, and never attains the degree which we find in large pleuritic effusion, or in pneumothorax.

2. *Resonance on percussion.*—The anatomical condition of the lungs in emphysema necessarily admits more air into the lung,—in fact the tissue is permanently distended with air,—and if percussion be made over the part, the sound is of course clearer than in a lung which is perfectly in the normal condi-

tion. This clearness is extremely great in thin persons who are affected with emphysema: if the patient be corpulent, and sufficiently advanced in life for the elasticity of the chest to be diminished, a moderate degree of emphysema does not render the percussion very sonorous. The clearness of sound is of course greatest at the spot where the dilatation is most perceptible; and when the chest is generally dilated, the percussion retains its character of great clearness throughout. The resonance in a few patients is sufficiently great to resemble a little that produced by pneumothorax, but it never has the tympanitic sound produced by the latter lesion.

3. *The feebleness of the respiratory murmur* is the third peculiarity of emphysema. The dilatation of the cells prevents a free circulation of air; they even remain permanently dilated when removed from the dead body. This immobility probably arises from the thickening of the walls of the vesicles, which always follows their permanent enlargement. The respiratory sound is not only enfeebled: but if the emphysema be extensive, it is apt to assume a peculiar rustling tone, which is probably in part produced by the motion in the vesicles themselves, and in part by their friction against the parietes of the chest.

The functional symptoms of emphysema are less characteristic than the physical signs, but are always sufficiently marked to increase the certainty of the diagnosis,—sometimes to indicate of themselves the character of the disease. One of them is much more constant than any other,—that is, the dyspnœa. The other symptoms depend in a great degree upon the complication of chronic or acute bronchitis which so often attends the disease; hence they vary according to the intensity of this affection. They are cough, expectoration of thick, pearly sputa, which are small in quantity, or of a large amount of thin, glairy, and transparent matter, which occurs in the paroxysms of the dyspnœa, or during the complications of acute catarrh. There is no fever or disturbance of other organs than the lungs or heart, which is necessarily connected with dyspnœa; when other affections occur, they may be set down as complications which may acquire additional severity from the pre-existence of the emphysema, but do not arise necessarily from it.

The dyspnœa is in part permanent, and in part comes on in paroxysms. The permanent dyspnœa is developed by any exercise which hurries the act of respiration, such as ascending a flight of stairs or a high hill, or indulging in any unwonted exercise. The subject of the disease then complains that he cannot take as much or as long-protracted exercise as other people; and this inability, if it be not accounted for by decided organic disease of the heart or lungs, is one of the best diagnostic characters of the disease. It is very regularly proportioned to the extent and severity of the emphysema, and in slight cases may escape notice. The dyspnœa which occurs in paroxysms is not frequent until the disease has become complicated with bronchitis, or, as is still more frequent, with a disease of the heart. In the latter case a disturbance of the circulation is frequently produced by slight causes, and then the paroxysms of difficulty of respiration become extremely severe and intense, until the patient is partially relieved by a free expectoration of glairy mucus from the bronchial membrane, or until he remains for a considerable time in a condition of perfect repose. If the patient be extremely corpulent, the frequency of the paroxysms is of course proportionally increased, and they become more and more severe as the disease continues longer, for the dilatation in the majority of cases tends to increase,—and each successive attack, by distending the vesicles, may act as a new exciting cause of a further enlargement of them.

The diagnosis of severe cases of emphysema is readily enough made, for the physical signs are then pathognomic of the affection; but in slighter cases they are not always clearly enough developed to render the diagnosis quite certain. This is the case when there is little or no dilatation of the chest, but merely an increased resonance on percussion, and a diminished loudness of respiration. We are then obliged to resort to the diagnosis by way of exclusion; and if we find that no other disease which can account for the permanent dyspnœa exists, we should ascribe it to emphysema. When emphysema is complicated with another disease of the lungs, or with one of the heart which in itself is capable of producing a corresponding dyspnœa, it is difficult to ascertain the precise influence of the two affections. If the dys-

pnœa be excessive, emphysema alone is rarely capable of producing it; but if it be more moderate, the probable share of each affection is extremely difficult to ascertain.

The prognosis in this disease is favourable, so far as the chances of death are concerned,—for it is scarcely possible for a patient to die merely of emphysema. But on the other hand, a complete recovery is scarcely possible, unless in very recent cases of the disease, when the distension of the air-cells has succeeded an acute disorder. In this case the disease tends gradually to recovery, although the restoration is rarely perfect; for the constant dilatation to which the vesicles are subjected prevents them from resuming their natural size.

The treatment of emphysema is in a great degree nugatory, so far as the removal of the lesion itself is concerned; but the paroxysms of dyspnœa may be checked, and the attacks of acute bronchitis relieved. The remedies most useful in checking the dyspnœa are sinapisms applied between the shoulders to the dorsal spinal vertebræ, and the use of lobelia in doses sufficient to excite slight nausea. If the tincture, which is the preferable form, be used, the dose should be twenty or thirty drops every two or three hours: some patients, however, will bear or even require a much larger dose, but for the greater number that just specified is sufficient. Opiates are also useful in some varieties of emphysema; they should be repeated often enough to quiet the cough; and in emphysema, as in common bronchitis, their effect is much enhanced by combining them with a nauseant. From a quarter to half a grain of opium will in general be found sufficient, if combined with the same or half the quantity of tartarized antimony. If ipecacuanha be used, of course the dose should be larger. The remedies which are most serviceable for ordinary bronchitis, are in general equally applicable to that variety which complicates emphysema; it does not, therefore, require any specific direction for the treatment. It is to these cases that the physician is chiefly called; for in the large majority of patients the emphysema itself is not a sufficiently severe disease to attract much notice from the subject of it.

CHAPTER X.

ASTHMA—NERVOUS ASTHMA—FALSE ASTHMA—PAROXYSMS—DIAGNOSIS—TREATMENT.

The term asthma is extremely vague, and is still used in a very loose sense. It is commonly applied to any condition of the respiratory system in which there is much oppression, especially if the dyspnœa comes on in paroxysms, and is attended with a wheezing noise during the inspiration or expiration. In many of these cases there is sufficient evidence of organic disease in the lungs or heart to account for the difficulty of breathing; hence the term asthma is then applied merely to a symptom, and does not designate a specific disease. In other cases there is no evidence of any organic alteration; and the asthma then becomes a peculiar disease, characterized by regular symptoms, but without definite lesions; it is therefore to be classed amongst those diseases to which the common designation, nervous, is applied. The term is a vague one; but if we restrict it to functional disorders which present a sufficient regularity of symptoms to identify them, there is little practical objection to it. In the present state of the science, therefore, we are compelled to admit a nervous asthma, and a periodical dyspnœa without organic lesion.

The diseases of the lungs which are attended with paroxysms of difficulty of breathing, are a variety of bronchitis, emphysema, certain rare cases of miliary tubercles, and the presence of large tumours upon the trachea or the larger bronchial tubes. This variety of bronchitis I have already treated of under its appropriate head; it is one of the most painful and harassing to the patient, but at the same time is the most curable variety of asthmatic diseases, for it often yields to the continued use of ipecacuanha, and other remedies of the kind, with appropriate

counter-irritants. The probabilities of cure are of course much enhanced by a voyage to a milder climate. Emphysema may be palliated, if not cured; but miliary tubercles is generally the most intractable, and often the most rapidly fatal variety of phthisis.

The tumours which give rise to periodic dyspnœa at first, will cause a permanent difficulty of breathing if they increase much in size; they are sometimes scirrhous growths, but more frequently aneurism of the arch of the aorta in adults, and scrofulous enlargement of the bronchial glands in children. The dyspnœa is at first not permanent in these cases, because the obstruction to the passage of the air is not sufficient to cause great difficulty of the respiration without some congestion of the bronchial mucous membrane; this is more and more apt to recur as the disease continues to advance, and the case may readily be mistaken for one of nervous asthma.

After striking those cases of false asthma from the list, we next come to the diseases of the heart which simulate the same disorder. These are quite numerous; indeed, any serious disorder of the heart which impedes the circulation may congest the lungs, and, as a necessary consequence, great dyspnœa will result. The oppression will be very nearly in proportion to the difficulty of the circulation through the heart, and must of course be greatest in those cases in which the valves are most obstructed. These diseases constitute some of the most severe cases of those classed under the general head of asthma.

There remains, then, a nervous asthma, which cannot be classed under these heads. This disease, like most other chronic affections, is in a great degree hereditary, and often passes through several members of a family; all, or a large number of the children of one family, are often subject to attacks of it upon exposure to slight exciting causes. These causes are extremely various; but they are in general such as act particularly upon the nerves of the respiration, and produce a slight oppression, even in individuals who are not at all asthmatic; such as the inhalation of deleterious gases, certain perfumes, a heated, and especially a crowded room, changes of temperature, or changes in the barometrical conditions of the

air, will all occasionally produce the same results. The effects of atmospheric changes which are not connected with temperature, and can only be recognised by a delicate hygrometer or barometer, are very peculiar; a very little difference in the moisture, or in the altitude of a particular spot above the level of the sea, being often sufficient to bring on or to remove a severe attack of asthma. The change from a lower and more crowded to a higher and more airy part of the same town will often produce the same effect. These attacks of nervous asthma are often periodic, or at least especially apt to recur at particular seasons of the year, which are not always the same, although the summer is in general more apt to favour the development of the disease than colder weather. But there is no disorder which is proverbially so peculiar in its time and mode of attack as asthma,—the most opposite conditions will modify the action of the nerves of respiration. These conditions do not, however, vary much in each individual; they are generally sufficiently regular, but they are extremely different with different persons who might at first sight seem to offer the same variety of the disorder. This idiosyncracy is not more remarkable than that which is observed in relation to many other functions of the body, especially the digestive, and is of course equally inexplicable.

The symptoms of nervous asthma are similar in this respect, that all who are affected with the disease are liable to sudden and violent paroxysms of dyspnœa, or to slighter derangement of the respiration; at the same time there are no decided signs of bronchial inflammation. If the respiration be examined, the inspiratory sound is feeble, but there is generally no rhonchus; the wheezing which is occasionally heard at a distance from the patient is produced almost exclusively in the larynx. The rhonchi and other signs of bronchial irritation are heard if the attack is accidentally complicated with acute bronchitis.

Paroxysms of true asthma terminate by a gradual decline, or as in the variety termed asthmatic bronchitis, the attack is not relieved until a free secretion of glairy liquid from the bronchial membrane takes place; in either case the disorder is singularly apt to return in a short time upon a renewal of its exciting causes.

The diagnosis of the disease is, like the prognosis, exceedingly simple. The disorder may always be recognised by the presence of the periodical dyspnœa, and the absence of any decided evidence of structural change. The prognosis is, on the whole, highly favourable; for few cases of the kind terminate unfavourably, but, like the asthma which arises from emphysema, the disease is exceedingly difficult to remove. At the same time the affection is so peculiar in its nature that it often ceases abruptly, without the slightest assignable cause; and at other times, an apparently insignificant impression made upon the nervous system, either directly on the nervous expansions, or indirectly through the medium of the imagination, will often stop a paroxysm, or postpone one for a long period. The prognosis, therefore, is peculiar; and it is very necessary to be guarded in our promises of cure, or in our anticipations of an unfavourable result when the case is most unpromising.

In most patients asthma may be greatly relieved by attending to the exciting causes of the disease, and carefully avoiding them when practicable. This is often less difficult than it would appear to be at first sight; for a very slight change of residence from one situation to another in the same city or district of country will often suffice. Sometimes a more distant removal becomes necessary, at least at the season of the year when the disorder is most apt to recur. Every patient is not however fitted to decide as to the proper change of situation. In the same way a change of occupation, or even the avoidance of certain departments of a particular business, will often succeed. If these attempts fail, and the patient is willing to make the sacrifice, a more decided change is advisable; and, in making it, the warm, moist regions of the sea-side, will generally be found preferable to the drier and more hilly country.

The hygienic precautions not connected directly with the condition of the air, are less certain in asthma than in most other diseases; and we must here also rely chiefly on the experience of the patient. Those causes which tend to produce bronchitis favour the development of asthma, although they do not cause it. Hence the avoidance of cold and unnecessary exposure is essential, unless the experience of the patient should teach him that

a cold atmosphere agrees better with him than a warmer one. In either case, however, the impression of prolonged cold upon the surface is almost always deleterious, whatever may be its direct influence upon the bronchial mucous membrane. Excesses in diet are also often exciting causes, and the particular perfumes or stimulants of the bronchial membrane which act unfavourably upon the disease, are generally well known to every patient.

There are many modes of arresting the paroxysms, and for the most part the remedies resemble each other only in their general power of producing a decided action upon the nerves of respiration. Frequently these remedies are the narcotics; at other times a mere counter-irritant applied between the shoulders will prove effectual in cutting short the paroxysms. In some cases a galvanic plate applied upon the nucha, and communicating with another placed at the point of the sternum, will instantly check an attack of this disorder; and although the cure is not always permanent, yet in some instances the disease does not return. The nauseants and antiphlogistics, which are often useful in emphysema, are sometimes equally effectual in arresting the paroxysms. Amongst them the tincture of lobelia is one of the most certain and convenient, but with some stomachs it is oppressive and irritating.

The various narcotics which are from time to time resorted to for the relief of asthma, may be administered in the usual way, or be inhaled into the lungs, and thus brought directly in contact with the bronchial membrane. Thus stramonium, tobacco, and other remedies of this class, are often smoked with great benefit; and a method recommended lately by M. Raspail, is sometimes of advantage. This consists in inhaling the vapour of camphor; a few pieces of it are placed in a quill, and the patient may breathe through it. The slow volatilization of the camphor brings it directly in contact with the lungs.

These means are, however, all palliative, and there is generally no certain relief for the disease. A careful study of the exciting causes, and attention to some very simple hygienic precautions, are the most promising means of treatment.

CHAPTER XI.

PNEUMONIA—ANATOMICAL CHARACTERS—PHYSICAL SIGNS—SYMPTOMS—TREATMENT—VARIETIES.

In the last chapter I concluded the subject of diseases of the mucous membranes lining the bronchial tubes. As I had previously described the inflammation of the investing membrane, it now only remains for me to give an account of the affections of the parenchyma of the lungs. It was necessary to treat of the diseases of the membranes first, because the parenchyma is very rarely, if ever, diseased, without the inflammation extending to them; for the tendency of disease of the lungs is to produce inflammation of the mucous membranes connected with them. What, then, is the parenchyma? To answer this question, it will be necessary to reflect upon the anatomical structure of these viscera. The bronchi continue to divide and subdivide, the ramifications becoming smaller and smaller after each division, and terminating in vesicles arranged in lobules; the vesicles of each of them communicate with one another, but not with those of the adjoining lobules; and each lobule receives a bloodvessel, which ramifies within it, and is distributed to the vesicles in the cellular tissue, which invests and unites them together. The parenchyma may, then, be said to consist of the air-vesicles, the bloodvessels surrounding them, and the cellular tissue; or the term may be extended further, so as to include the ramifications of the tubes within the lobules, yet not the tubes which lead to them. The latter definition answers better in a pathological view, inasmuch as the smaller tubes are always involved in diseases of the portion of the parenchyma through which they pass. The term parenchyma being then understood to include these finer tubes, we designate the disease as bronchitis when the inflammation attacks the large

bronchial tubes, but extends no further than the tubes which lead to the lobules: as pneumonia, when it extends to the smaller tubes within the lobules, and to the air-cells of the part affected.

Pneumonia, which is an inflammation of the parenchyma of the lungs may commence in two ways,—either as a bronchitis, the inflammation in this case extending to the smaller tubes and air-vesicles; or it may originate in the vesicular structure, and subsequently involve the larger tubes, just as dysentery may commence in the form of diarrhœa, and pass into dysenteric inflammation, or originate in the latter form, and present the symptoms of dysentery from the first. When the bronchial tubes only are inflamed, as soon as a secretion takes place it is removed from the body, and the inflammation is partially relieved, so that the disease rarely does much harm; but when the lobules are inflamed, the exit is closed, and the fluid accumulates in the lung, thus increasing the congestion and impeding the respiration, but not relieving the inflammation by a natural depletion. This fluid consists at first of a bloody serum, and is often of a reddish colour. It afterwards passes through the stages of lymph and pus. In hemorrhage, the blood contained in the cellular tissue is arterial in its character; in apoplexy it is venous, and in inflammation it partakes in a measure of the nature of both. The lung at this stage of the disease yields readily to pressure with the finger, and the fluid can be expressed from it. In post-mortem examinations the sound appearance may be confounded with engorgement produced after death, in a dependent portion of the viscus; and there is frequently some difficulty in making the distinction between the two,—but the redness of inflammation is always brighter, and the softening of the tissue is more decided. Still, the two conditions are not very dissimilar, for the congestion, if it occur during life, may readily pass into inflammation.

Pneumonia passes through several stages between its commencement, which I have described, and termination; and its symptoms, in accordance with the changes of structure, are divided into four stages. The first is characterized by engorgement of the tissue; the second by induration, which has received several names, as hardening, red softening, hepatization. It is

called hardening, on account of the increased consistency which is perceived when it is slightly pressed: softening, on account of the facility with which it is broken, if the pressure be increased; hepatisation, from its resemblance to the tissue of the liver. The vesicles of the lung being deprived of air, and engorged with blood, resemble the acini of the liver, their colour being thus changed to a red or brownish-red. In the case of children, this resemblance is so close, that I have known a bystander to mistake a piece of lung for liver, although both tissues were before him. A small piece of lung in this stage of the disease will sink in water, although a large mass of it may float on account of some portion of it containing air in its cells; whereas, in the first stage, the whole of the tissue is lighter than water. The bronchial tubes are red, and filled with a fluid containing a large portion of lymph, which in many cases closes the smaller tubes, thus reducing the lung to an uniformly solid mass. If the lung be torn, or even if simply cut, it presents an irregular granulated appearance, which arises from the vesicles being separately hardened and enlarged, while they still retain their individual form. They therefore project above the level of the adjoining cellular tissue.

In the third stage the lung remains indurated, but assumes a yellowish colour. In this stage the lung contains a considerable quantity of pus, diffused through the cellular tissue, and deposited in the vesicles. The tissue loses its granular appearance, and becomes more smooth and polished, the vesicular structure having been completely obliterated. It yields readily to pressure, and breaks under the finger, affording a puriform liquid, which at first consists of a mixture of pus and blood globules floating in serum, and afterwards of pure pus. By placing the diseased lung under a stream of water, the parenchyma may be completely removed so as to leave nothing but the bronchial tubes. The bronchial mucous membrane is not so red in this as the second stage, and the tubes contain purulent liquid.

We may admit a fourth stage, in which the parenchyma is softened down and removed by expectoration, and an abscess remains, resembling an abscess in the other tissues of the body; a pus-secreting membrane is formed, and pus is thrown out, which becomes less and less in quantity until cicatrisation takes

place, and a cure is effected. This stage of the disease is rarely met with; but when it does occur the patient usually recovers; for a simple abscess in the lungs is a perfectly curable lesion. However, if the patient has strength enough to go through the first three stages of the disease, he will generally survive the fourth, though he may require the aid of artificial stimulants. The symptoms are generally somewhat relieved by the formation of an abscess, as the inflammation is thus circumscribed in its locality. If, however, instead of there being a circumscribed abscess, the pus is diffused through the lung, a fatal termination will generally take place.

Symptoms.—The physical signs of pneumonia, like the lesions, occur in a regular series. The signs in the first stage are obscure, but in the second they become very plain; hence they are looked upon as the pathognomonic signs of the disease. In the first stage the lung is infiltrated with a thin liquid; this produces a sort of rustling respiration, and not unfrequently the respiration at the time is rude; that is, the vesicular murmur loses its natural softness and fulness, and the air rushes abruptly into the cells.

Subsequently we meet with another sign, which is said to be pathognomonic of the first stage. This is the crepitant rhonchus. It is indeed pathognomonic when it does exist, but it is not present in all cases: for when the inflammation is seated near the centre of the lung, the engorged vesicles cannot dilate; as this rhonchus is produced by the expansion of the diseased vesicles, of course it cannot be heard. Besides the healthy tissue, which is to be found between the ear and the diseased lung, gives rise to a healthy vesicular respiration, and prevents the crepitus from being heard after it is formed in the inflamed portion. But when the seat of the inflammation is near the surface it always occurs. There is also slight dulness on percussion, which is caused by the secreted liquid partially displacing the air in the tubes. The dulness is, of course, not considerable, for the air is not completely expelled from the diseased portion.

The signs of the second stage are more strictly pathognomonic of the disease. In this stage the tissue of the lung is completely altered, and this alteration is attended with corresponding physical signs. On percussion we find complete flatness, as the cells

are filled with fluid, and no air whatever is contained within them. Auscultation gives us, 1st, a bronchial respiration, which is more marked in the second stage of pneumonia than in any other affection of the lungs, as the tissue is perfectly consolidated without any obliteration of the tubes. It is that variety of bronchial respiration which on account of its loudness has been denominated tubal; it is most distinctly heard at the root of the lung, where the tubes are of the greatest caliber. Bronchial resonance of the voice, or bronchophony, is also heard, and in fact it always co-exists with the bronchial respiration. If the patient breathes rapidly the crepitant rhonchus is also heard in many cases co-existing with the bronchial respiration; this arises from a portion of the lung remaining in the first stage of inflammation, or which at least is still capable of admitting air to the vesicles. It is then heard in trains, like the crackling of wet powder, in the tissue which has not been indurated, and which surrounds the solidified portion. This state of things is very frequently met with.

These signs are present in all cases except when the patient breathes too feebly to impel the air through the tubes, when of course they are not heard: but as they are so constantly met with, they are usually described as the pathognomonic signs of pneumonia. The patient should always be directed to cough when you suspect that he is in the second stage of pneumonia; and we will then find that the bronchial respiration is made much more distinct, and the air is driven so suddenly into the smaller tubes during the following inspiration, that a very characteristic crepitus is produced either in the same spot as the bronchial respiration, or very near it, for the lung can never be completely solidified.

The signs of the third stage are not so characteristic of the disease; but if we have followed it through the previous stages we cannot be at fault, nor can we find any difficulty if the signs of the first and second or of the three stages be present at the same time. But if the patient is seen for the first time in the third stage, we may, by relying on the general symptoms, mistake the disease for an affection of the brain, which it sometimes much resembles. The signs are, in the first place, those connected with percussion, which is perfectly flat, as the lung remains solid

and very little air is contained in the tubes. The results given by auscultation are obscure, as the current of air has by this time been diverted from the diseased lung, just as the blood is diverted from a grangrenous limb, and therefore little or no sound is heard. The respiration when heard is feebly bronchial; a mucous rhonchus is also present. We have, then, as signs of the third stage flatness on percussion, feeble bronchial respiration, and mucous rhonchus. The resonance of the voice is proportional to the respiration, and is of course feeble. These signs are all very obscure, and therefore we may often be foiled when called to a patient in this stage of the disease. There may still be heard in very strong inspirations a decided crepitant rhonchus; but this is rather owing to a portion of the lung which remains in the first or second stage, and admits the air in very strong inspirations.

The signs of the fourth stage, or that of abscess, are the usual signs of formation of a cavity, viz., at first a mucous rhonchus becoming more loose and large, until at last a well-developed gurgling is heard, produced by the passage of air through the pus contained in the cavity. The following table will give a condensed view of the physical signs connected with the different stages of the disease:—

First stage, or engorgement.	Rude or harsh respiration; crepitant rhonchus.	Percussion clear, or nearly so.
Second, or hepatisation.	Bronchial respiration; bronchophony; crepitant rhonchus around it.	Percussion flat, or very dull.
Third, or purulent infiltration.	Bronchial respiration in large tubes, feeble or absent elsewhere; mucous and sub-crepitant rhonchus; bronchophony imperfect.	Percussion flat.
Fourth stage, or abscess.	Cavernous respiration, gurgling.	Percussion flat.

In practice, several of these stages may co-exist in the same lung; but the signs of each may be recognised without difficulty, and the proportionate extent marked out with tolerable precision.

When the disease terminates by recovery it gradually retraces its steps until it returns to a healthy state. The signs connected with this return to health are called the *signs of return*, or of recovery: their regularity depends upon the stage which the disease had previously reached. If the disease advance no further than the second stage, it will regularly return to the first. When first the crepitant rhonchus of return is heard it is looser or more moist than the true crepitant; this gradually subsides and the vesicular respiration re-appears, but remains for a long time much more feeble than it was previously to the attack. The bronchial respiration and dull percussion do not suddenly cease, but remain in some degree for a considerable time after the cessation of most of the symptoms of the disease, and often may be distinctly heard after the health of the patient is almost restored. This depends upon the consolidation of the lung, and the difficulty with which the tissue returns to its vesicular expansive condition.

When, however, the disease has reached the third stage this series of changes does not occur. The mucous rhonchus is the first sign of improvement observed; it depends upon a large quantity of fluid which is poured into the tubes. The crepitant rhonchus of return is not heard because no air passes through the smaller tubes. The fluid which is produced in the bronchi consists of mucous and purulent matter, resulting from the breaking down of the diseased tissue, and the secretion from the tubes passing through the inflamed mass. The secretion of this fluid contributes very much to the relief of the disease. The liquid gradually becomes more and more mucous until it is perfectly natural in its appearance.

The return from the fourth stage is marked by the secretion of pus becoming less and less, and at last disappearing with the cicatrisation of the parts involved in the abscess, while the secretion becomes entirely mucous in its character.

These stages belong to pneumonia of a perfectly frank cha-

racter; they are, however, liable to be modified by various circumstances which are necessarily attendant upon the disease. There are some lesions of other organs than the substance of the lungs always found in pneumonia,—that is, inflammation of the pleura and of the bronchial mucous membrane. The pleurisy is at first dry, and merely produces slight pain and a feeble sound of respiration. When the pleurisy is slight, the affection is simply called pneumonia; when the pleurisy is severe and attended with a large effusion it is called *pleuro-pneumonia;* and when the pleurisy is considerable, with very slight inflammation of the parenchyma, it is usually merely termed *pleurisy*. When the pleuritic effusion is considerable, the signs of one or the other affection predominate according to the relative stage of each disorder; the pneumonia is apt to decline sooner than the pleurisy, which may remain for an indefinite period after the cessation of the inflammation of the substance of the lung.

The bronchitis which attends pneumonia may be confined to the tubes which lead to the lobules which are inflamed, or it may extend throughout the bronchial tree. That which is confined to the inflamed portion of the lung is always present to a greater or less degree; but the bronchitis which extends fairly throughout the tubes is extremely variable, and generally takes place under two different circumstances. In one the bronchitis occurs as an ordinary catarrh, and the pneumonia occurs afterwards during its progress. In the other the bronchial affection comes on late in the disease, and generally in the third stage of it, when the purulent secretion is copious, and passes into the bronchial tubes.

Having mentioned the physical signs of frank pneumonia, I shall now proceed to consider the functional signs of this affection. These are of three kinds—local, secondary, and general. The local comprise cough, expectoration, frequency and mode of performance of the respiration, and the pain produced by the act of breathing. By secondary signs we mean the affections of the brain, alimentary canal, the assistant chylopoietic viscera, &c. The general signs are those which are common to all inflammatory affections, as the condition of the circulation, &c.

Local signs, cough, &c.—The cough is usually at first the

ordinary cough of acute bronchitis, which is either hoarse, or a loose mucous cough. In this case the bronchitis is the predominant affection; as soon, however, as the parenchyma becomes seriously affected the cough changes its character, assuming the type which is called pneumonic. The pneumonic cough is short and suppressed, which results partly from the pain felt during the act of coughing, and partly from the impossibility of inflating the lungs completely; hence the force of the column of air, which is expired during the act of coughing, is not sufficient to cause a loud and distant sound. The pneumonic cough begins from the first, if the disease attack the parenchyma and pleura before passing through ordinary bronchitis. The cough sometimes exhibits this character from the first. In some cases of pneumonia the cough is wanting throughout the course of the disease, which is then said to be latent; in such cases the patient is generally aged, or the pneumonia succeeds another affection. As the disease proceeds, secretion takes place, and the cough again becomes loose; when an abscess is formed it becomes exceedingly loose and rattling.

The frequency of respiration is increased in pneumonia, and the degree of this increase is a tolerably exact indication of the extent of the affection. The frequency of respiration arises from the diseased lung being rendered unfit for the performance of its functions, so that a smaller portion of the blood is exposed at once to the action of the air, and a smaller quantity of the air is inhaled during an inspiration. Therefore it must be changed more frequently. Besides, the inflation of the healthy portion of this lung is less complete than natural, because the motion of the chest is partially suspended, and the action of the respiratory muscle is less complete. Where only one lung is slightly diseased, the frequency of the respiration is but very little increased. If the disease embraces the whole of one lobe of the lung it is increased to forty or fifty a minute: and when both are involved the respiration will be as frequent as fifty or sixty in the minute. Should it be more frequent the extent of mischief is very great. It must be evident, then, that this sign is important for the prognosis of the disease. The mode of performing respiration differs from that observed in the healthy

state. The patient breathes irregularly; the respiration is usually high, and is performed chiefly by the side of the chest which is not inflamed. At first it is not strictly abdominal: but after pneumonia has continued for a time this character is developed, and then the ribs remain nearly motionless.

The pain is very variable, and is proportioned to the inflammation of the pleura. When the inflammation is situated near the surface of the lung, the pleura is necessarily much involved, and the pain is consequently acute; but when it is deep-seated, there is, generally speaking, little or no pain. In the old and feeble the pain is scarcely felt, whatever be the portion involved. Therefore, as in many cases it is wanting, and as when present it does not indicate the extent of the pulmonary inflammation, it is a sign of comparatively little importance.

The expectoration at the commencement of pneumonia consists of mucus, such as is observed in ordinary bronchitis, and differs but little from the healthy secretion. As the disease is developed it becomes viscid and transparent, and in some cases is of a rusty colour, but the viscidity and transparency are considered as the characteristic properties of the pneumonic sputa. It is sometimes so viscid that it will not flow from the vessel containing it, although the latter be turned bottom upwards. It is small in quantity, generally from one to four ounces in twenty-four hours; its becoming more abundant is generally a sign that the disease is retrograding: sometimes it is mixed with yellow sputa from some other portion of the lung or tubes. As the disease passes from the second into the third stage we observe an admixture of pus, which renders the liquid muco-purulent, it is at the same time much more abundant than it was previously; when it declines the sputa become thinner and more mucous in their character. If an abscess form, the sputa become decidedly purulent, and a large quantity is either suddenly discharged or expectorated in a very short time. This is to some extent the case when the third stage is so far advanced that a considerable portion of the lung is softened into a pulp, even if there be no large cavity.

The secondary signs may be divided into those connected with the lungs, and those dependent upon other organs.

Inflammation of other organs.—Bronchitis and pleurisy almost always attend pneumonia, but their severity varies exceedingly. Tubercles are sometimes formed in the lung during the course or in the decline of pneumonia, which, though it is not probably the sole cause of their formation, it in many cases hastens their development. Their formation, of course, increases very much the gravity of the prognosis. Emphysema is sometimes produced during an attack of pneumonia, principally in children. This lesion is not so important when it is an affection owing to pneumonia, as when it has existed previously to the occurrence of the latter affection, in which case, by increasing the dyspnœa, it renders the prognosis more unfavourable.

The heart is very often secondarily affected in this disease, sometimes from the general diffusion of the inflammatory action, and sometimes from the imperfect performance of the function of respiration, the blood becomes congested in the right ventricle, and in some cases a coagulum is formed in the ventricles in consequence of the imperfect circulation, and of the highly fibrinous state of the blood. But often, in addition to this, we find inflammation of the lining membrane of the left ventricle, which is much more frequently affected in this manner than the right, in consequence of the general law, that the arterial system is more subject to inflammation than the venous. This occurs in a large proportion of the severe cases of pneumonia. This affection of the heart varies in intensity—sometimes the membrane is merely reddened, sometimes it is opaque and thickened, partly by the deposition of lymph, and occasionally it is ulcerated; the ulceration is generally seated at the valves. These cases of endocarditis are sometimes distinguished with difficulty, because the symptoms are in a great extent masked by those of the pneumonia. They always constitute a grave complication of the disorder.

The brain is very often affected in pneumonia, and when the inflammation of this organ occurs it is attended by delirium, such as takes place in common arachnitis. The medullary cerebral substance is not often the seat of the inflammation, which in almost all cases is confined to the membranes, and to the cortical substance. Dr. Louis says, that one-sixth of the cases of

pneumonia which he saw were complicated with an affection of the brain; like the inflammation of the heart it occurs most frequently in the very severe cases of pneumonia. If the cerebral symptoms should be severe the primary affection is generally masked by the secondary, which often gives rise to an error in diagnosis, as the signs of arachnitis remain very evident while the functional signs of pneumonia are obscured, and, therefore, liable to be overlooked. The cough may cease almost entirely and the expectoration disappear; and, in fact, all the thoracic symptoms may be concealed by the occurrence of the meningeal inflammation. Cases of this kind are sometimes distinguished with difficulty, they are not, however, very frequent. This complication adds very much to the gravity of the prognosis; and unless active treatment be resorted to at the commencement of the attack the disease is very apt to prove fatal.

The liver is sometimes involved in pneumonia, but the frequency of this complication varies at different seasons, and in different localities, being much more common on our southern Atlantic coast than it is at the north. This inflammation of the liver is distinguished by some authors from bilious pneumonia, although it closely resembles it, and, as it seems to me, differs only in the bilious pneumonia described by Stoll, being an epidemic disease. Its signs are jaundice, pain in the side and shoulder, and cerebral symptoms, such as stupor and somnolency, which are dependent upon it. Bilious pneumonia, though in some years common amongst us, is now very rare. It differs from pneumonia in which the affection of the liver is a mere secondary complication, by the liver being attacked in bilious pneumonia, simultaneously with the lung.

The right lung is the one which is always most inflamed in pneumonia complicated with the inflammation of the liver; and the transmission of the inflammation from the lung to the liver, in the simultaneous attacks of the two organs, shows that there must have been previously a disorder of the liver, which favoured at least the extension of the disease. Hence the affection is so frequent in warm climates and miasmatic situations. This complication certainly adds much to the difficulty of diagnosis without the physical signs, especially as the cerebral symptoms, such

as stupor or delirium, are generally so well marked as to suppress, in a great degree, the cough.

Inflammation of the stomach and bowels, of the œsophagus and pharynx, have all been observed in pneumonia—and also inflammation of the kidneys; but these complications are not more common in this than in other inflammatory diseases. They may be known by their proper local signs, and I shall therefore not enter into a minute account of them.

General signs—Capillary circulation.—A sign which may be called general, although confined to very narrow limits, is the appearance of the face, for this depends upon the capillary circulation. In acute cases we meet with a circumscribed flush of a circular form, and which is sometimes confined to one cheek, sometimes found in both. When one cheek only is affected in this manner it is more frequently, though not invariably, that which corresponds with the diseased lung. In some cases the whole face is flushed, the colour varying from a light to a deep red; sometimes it is still deeper, and may be almost of a bluish colour. The whole countenance is generally changed. These various tints depend upon the greater or less obstruction of the circulation of the blood through the heart and lungs, they are darker when the difficulty of the circulation is greater, and often become bluish about the lips and nostrils, while the rest of the face is pale, if a coagulum should form in the heart. Dilatation of the nostrils in each inspiration is another symptom; this depends upon the dyspnœa, and its extent is in proportion to the latter.

General circulation.—The disease makes its appearance in the following manner: The patient is almost always first seized with a chill; this lasts half an hour or more, and sometimes two or three hours, and when it goes off is succeeded by a fever, which continues during the whole twenty-four hours, but usually increases at night, and is rarely attended with extreme heat of skin. The pulse is full, hard, and developed at the commencement of the disease; in the latter stages it is frequently feeble. It is very generally from ninety to one hundred and twenty and rarely becomes more frequent, except in the terminating stage of the disease. It is in most cases a good measure

of the intensity of the inflammation, and a correct indication of the propriety of bloodletting; but the pulse is sometimes contracted, and at the same time the inflammation is violent; if bleeding be practised it rises and becomes softer. A careful bleeding, if the general symptoms be inflammatory, is the best guide in this matter.

The alteration of the strength is another sign which is connected with inflammatory diseases. In general the degree of diminution depends upon the importance of the part affected, and the extent to which the inflammation proceeds. Thus, a patient with pleurisy will continue to walk about until the effusion causes so much dyspnœa that he is compelled to keep his bed; whereas a slight pneumonia, with scarcely any local signs, will often enfeeble him so much that he will be unable to sit up.

Diagnosis.—Although the physical signs are the most important in the diagnosis, as they indicate the extent as well as the nature of the affection; yet there are certain rational signs, which taken together may be considered as pathognomic, namely, the chill and fever, the pain in the side, the entire loss of strength, the expectoration, flush, and dyspnœa: these are, however, often obscure at the commencement of the attack. The physical signs are often only required to ascertain the extent of the disease, as its character is rendered sufficiently apparent from the rational signs of sthenic pneumonia.

Prognosis.—The prognosis is very variable in all diseases of this kind, as it often depends upon circumstances unconnected with the disorder itself. In ordinary frank pneumonia the prognosis is favourable where other things are not unfavourable; that is, where it attacks a person previously in good health, and the treatment is commenced early, for this modifies the disease very much when begun at an early period; but after it has continued a few days the prognosis is very little affected by it. When it is complicated with an affection of the brain or liver, the prognosis is more unfavourable. When this disease occurs in very old persons, it is always much more dangerous than when it occurs in the young or the middle-aged. The danger seems to increase very nearly in proportion to the advance in years—aged patients dying often of the complicated inflammation.

Duration.—A mild case of frank pneumonia without treatment usually lasts from ten to twenty-one days, but if it has reached the third stage it will last much longer. If it has continued a few days before the commencement of the treatment it rarely ends before the tenth day. If you treat it from the first, you may frequently produce a partial jugulation of the disease, and shorten somewhat its duration. The observations made at Paris coincide in this respect with the experience of Dr. Jackson of Boston, and the results obtained in this city. When the disorder terminates fatally, death usually occurs early in the third stage, or just in the passage from the second to the third stage. This stage is reached in different periods, sometimes in three or four days, but generally about the beginning of the second week.

Treatment.—The treatment of frank pneumonia is that of ordinary inflammation modified by the peculiarities of the organ affected. Hence bleeding is the most efficient remedy, and should be practised freely at the beginning of the disorder. The method which has of late years been revived by Dr. Bouillaud, consists in repeated bleedings, which are prescribed again and again for several days. This method is reduced to a regular formula, and in the hospital practice there are not so many obstacles to this system as in private; but it must be obvious to every one that no one method of treatment, or at least no regular formula, is applicable to all cases, and I do not, therefore, advise a uniform method of bloodletting. The best directions must be gathered from a knowledge of the disorder, and from the present symptoms of the patient. Thus, in the commencement, a very large bleeding, pushed to the verge of syncope, is certainly best in a plethoric individual, or a moderately strong person, previously in good health, if the pneumonia is of a highly inflammatory kind—that is, if the evidence of vascular excitement be decided; for it is in these cases that the inflammation tends necessarily to diffuse itself, as it were, over a large surface, and to attack several organs, especially the serous tissues of the circulating system. A large bleeding is of course the surest means of checking this tendency, and is the most comforting remedy for the patient, as it at once diminishes the headache and the oppression which are

amongst the most disagreeable symptoms. A general bleeding produces much more effect than a local one, which is almost nugatory in its action upon the highly inflammatory cases of pneumonia, although very powerful in the later stages, or in the slighter forms of the disorder. The venesection may be repeated on several successive days, or in the after-part of the days in which the first bleeding was practised, if it seem necessary from the excitement of the pulse and the vascular action. That is, if the pulse should rise again, and especially if it should become more developed after the first bleeding. It is, as you may readily suppose, impossible to lay down positive and unvarying directions for conditions of things which are in their nature changeable. But by reflecting on the condition of the lung, which at first is merely that of engorgement or commencing hepatization, and on the stimulant properties of the inflammatory blood, it is easy to see that several bleedings may become necessary; although in the majority of cases one single bleeding will suffice, especially if the sedative effects of it be kept up by other remedies, particularly the antimonials.

The appearance of the blood drawn is, of course, highly inflammatory,—that is, much buffed, with a very firm crassamentum; this is a tolerably correct, but not a sure guide for the repetition of venesection. The blood will generally remain buffed, even in that period of the disease when bleeding is no longer of benefit.

A physician is frequently called to a patient late in the disorder, when the inflammation has either not been treated by bleeding, or the disease continues very severe. It is very difficult in these cases to decide as to the propriety of general bleeding; my own impression is, that bleeding is in these cases apt to produce a double influence, which is partly of mischief and partly of benefit. The inflammation, which is generally commencing in certain parts of the lung, or at least is much less advanced than in others, may be, to some degree, checked by the bloodletting; but those portions of the tissue in which the blood is completely stagnant, and, as it were, incorporated with it, are restored with more difficulty if blood be drawn from the general system. This is still more strongly the case, if the pneumonia

has in part passed into the third or suppurative stage. The effect of bloodletting upon the general circulation is also in these cases often productive of evil, for the coagula which begin to form in the heart may become a greater obstacle to the circulation if the strength of the patient be lessened. The latter effect is difficult to demonstrate; but it has struck me in a number of cases that it was founded on good grounds, and I therefore state it for what it may be worth.

The action of local depletory means in acute sthenic pneumonia is much more limited than that of general bleeding; the beneficial effects of these remedies are most important in the latter stages of the disorder, when a portion of the lung remains in the first or second stage of the inflammation, but the greater part of it has passed into the third stage. The local bleeding, then, seems to get rid of the remaining inflammation with less exhaustion of strength. When we meet with patients who have been neglected during the greater part of an attack of pneumonia, we are often obliged to limit our depletory measures to cups or leeches. The cups should be applied to the posterior parts of the chest, immediately over the inflamed lung. They should be used in considerable numbers, say six or seven, and may be repeated once or twice if the disease does not abate.

Blisters, or tartar-emetic ointment, are not necessary as a general rule in acute pneumonia; for the disease belongs to those inflammatory disorders for the earlier stages of which blisters are not adapted. They are useful, however, at the beginning of the third stage, when the benefit from them is scarcely equalled by that from any other remedy in the treatment of pneumonia. The blisters then act with great power in checking the inflammation, at the same time preventing the collapse which is so frequent at this stage of the disease. The blister should be rather large, and in general the best place for it is under the axilla, or between the scapula and the spine. Tartar-emetic ointment, applied so as to produce a very rapid pustulation, has been recommended under similar circumstances; but I do not in general regard it as possessing any advantages over blisters, while it is for many reasons inconvenient. Sinapisms, or other rubefacients, are often useful within certain limits,—that is, as stimulants to

the general strength, and as remedies which have a powerful influence upon the dyspnœa which attends the disorder.

Next in importance to general bloodletting as a remedy in pneumonia is the tartrate of antimony: this medicine may be given in several ways, either as a simple diaphoretic expectorant, or as a direct arterial sedative. In the former case it should be given in doses from a twelfth to a quarter of a grain every two hours; in general a sixth of a grain is borne at first, and afterwards the patient should take a quarter of a grain, either alone or combined with nitre or calomel. The medicine is, in these doses, quite free from danger, except in a very few individuals of extremely irritable temperament; for there are some patients who cannot bear antimony in any dose, or in any form. In most cases, however, these small doses of a sixth of a grain are attended with a disposition to sweating, and a diminution in the excitement of the circulation, which, on the other hand, always coincides with a diminution of the general inflammatory action, which plays so important a part in the pathology of acute pneumonia. The antimony should generally be continued during the earlier stages of ordinary acute pneumonia, but it must be given in less doses when the strength of the patient becomes notably diminished, or the irritability of the stomach should be excessive.

Of late years the contra-stimulant, or Italian method of giving antimony in very large doses, has been often resorted to in the treatment of pneumonia. This method has been perfected in France, and rendered much more safe. In my own practice when I have followed this method, I have adopted very nearly the usual formula of the French hospitals; it is as follows: Tart. Antim., gr. vj.; Aq. Menthæ., ℥vj.; Gum. Acac., ʒij. M. Of this a table-spoonful may be taken every two hours. It is not always customary to add the gum arabic, but the irritation of the stomach is certainly lessened by it. The antimony, taken in this dose, frequently produces no other effect than purging, which does not invariably follow. If the purging is severe it is readily checked by adding a few drops of laudanum to each dose. In itself opium is rather objectionable, but it may be properly used if there is a decided tendency to purging.

The medicine should be continued in this dose for twenty-four hours, and not increased until the next day, when eight grains may be given instead of six; either in the same or in a larger quantity of vehicle. It is better to avoid giving it in too concentrated a form, for it then would probably produce much vomiting or at least retching. If the tolerance has been established the first day,—that is, if the remedy has not produced decided puking or purging, or very debilitating sweats, it may be safely taken during the second day; and if the disease does not abate, the dose for the third day should be the same as that for the second. But after the third day there is some danger in continuing the antimony in a high dose, unless the patient is perfectly conscious, and his brain entirely clear; if the remedy be then attended by no uncomfortable sensations there is little danger in its administration. But if the patient is comatose, or even slightly stupid, very extensive inflammation and other structural lesions may follow the administration of the tartarized antimony without any symptoms to indicate them. If the cerebral functions are unimpaired, the condition of the nervous system is a very faithful guide for the administration of tartarized antimony.

The good effects of the medicine are shown by the diminution of the local signs, and of the oppression and fever; this is especially obvious in the local signs of the pulmonary inflammation, for the antimony seems to act more quickly upon the parenchyma of the lungs than even general bleeding. When the symptoms have declined, the remedy should be gradually diminished, and not suddenly discontinued; about two grains should be taken from the entire quantity each day until the whole amount is withdrawn.

There is some danger or at least inconvenience in attempting to give antimony in these doses to certain individuals who possess a peculiar idiosyncrasy with regard to the medicine; for there are some persons who cannot bear it in any form, or even in small doses, without great nervous distress and extreme prostration. To such persons the remedy should never be given, at least not in any other than in very minute doses. Besides these peculiar cases, the antimony will occasionally produce injurious effects from the mere purging or excessive emesis which it occa-

sions,—chiefly from the former cause. It is true that the addition of a small quantity of opium, or even the mere persistence in the remedy without an opiate, will often suffice to arrest such a tendency; but if the patient should not lose this extreme susceptibility to the antimony, it becomes necessary to discontinue it.

The remedy which is next in power to antimony is mercury, although its effects are somewhat different. When given in the period of hepatisation it acts in two ways,—as a directly antiphlogistic remedy, and as possessing a peculiar power in preventing, or at least checking the formation of lymph,—in other words it is antiplastic. Hence, when given after bleeding, it is directly opposed to the progress of the inflammation, and modifies the products which result from it. Mercury should be given in such doses as to produce a full impression upon the general system, not amounting to ptyalism, but producing a slight action upon the gums, as an evidence of its constitutional effect. The proper dose is from a quarter to half a grain of calomel every two hours if it be desirable to make a rapid impression; from a third to half a grain three times daily if the mercury be designed to act more slowly. Even less doses produce at times a good effect.

The calomel is often combined with ipecacuanha or opium; but the latter remedy should be given with great reserve in acute inflammatory pneumonia: the ipecacuanha is free from danger, and is generally of service by its power of facilitating the operation of the mercurial and promoting secretion from the lungs. It should be given in doses of about one grain every few hours: generally the patient will bear it well.

The mercurial impression is usually followed by a rapid decline of both general and local symptoms. If it should fail, the disease assumes one of two forms,—it either remains in the highly inflammatory condition, or it passes into the third stage of the disease. In the first case it may become necessary to recur again to depletory measures; in the second blisters to the chest, with stimulating expectorants, and sometimes wine whey, or in persons addicted to the abuse of alcohol, milk punch may become necessary.

The expectorants which are of most value when the antiphlo-

gistic treatment has failed, are the eupatorium and senega, or the sanguinaria. These may be given in the form of infusion—half an ounce of eupatorium and two drachms of senega in a pint of boiling water—of which from a table-spoonful to a wine-glassful, according to the susceptibility of the patient, should be taken every two or three hours; or the senega and sanguinaria may be combined in the dose of two or three drachms of senega, and one of sanguinaria, in half a pint of boiling water; and a table-spoonful may be given every two hours, unless it should excite much nausea. In a few cases the dose may be increased.

After the acute symptoms of pneumonia are dissipated, the patient will often continue to cough a little; and on examination it will be found that the bronchial respiration has not entirely ceased at the root of the lung. This state of things depends upon the very slow absorption of the substance which is effused into the cellular tissue of the lung. It requires no special treatment, and in a little will cease; still the patient should avoid exposure to the cold damp air, and to promote the resolution he may wear a Burgundy pitch-plaster, or some similar covering over the part affected.

LOCAL PNEUMONIA.

Besides the highly inflammatory cases of pneumonia there is a variety of the disorder which is also simple and inflammatory, but more local in its action, attacking only a small portion of the lung, and therefore not producing the general inflammatory action of the severer cases. The local signs of pneumonia are present in these cases, such as bronchial respiration and crepitant rhonchus; but the fever is moderate, or may not exist at all, and the prostration is but slight. These cases cannot be distinguished from ordinary catarrh, except by the local signs and the expectoration, which is generally, but not invariably, characteristic.

The duration of these cases rarely exceeds a fortnight, but in general it does not extend beyond ten or twelve days. The patient is not often confined to his bed, and in some cases he

feels so little inconvenience that he will insist upon going out and following his usual employments. The prognosis is always favourable, unless some unexpected aggravation of the disease should take place.

The treatment in this form of local pneumonia is extremely simple. The disease tends so universally to recovery that there is little difficulty in its management, and the large majority of cases would get well under any treatment. It is, however, quite possible to hasten its course. For this purpose the best remedies are, at the very commencement, a moderate bleeding, or after the first few days one or two applications of cups to the affected parts. These remedies will relieve the lung, and facilitate the cure, which is brought about by exciting secretion from the inflamed surface. If the secretion takes place readily, or if the inflammation is very slight, bloodletting in every case is not at all necessary; but if the pulse be excited the symptoms are more or less relieved by venesection to some twelve or fifteen ounces, and no inconvenience at least will result. Bleeding, however, is never followed by the same decided benefit as in the cases of highly inflammatory pneumonia.

The secretions from the lungs are promoted by the same treatment which is applicable to the declining stages of the last-mentioned variety,—that is, the infusion or the syrup of senega or ipecacuanha, or the infusion of eupatorium or sanguinaria, or combinations of these with the senega. Small doses of the antimonials are also productive of prompt relief when the patient is feverish, but I do not regard the antimonials as so generally useful as the vegetable expectorants especially the ipecacuanha. Towards the decline of local pneumonia the case requires some attention to distinguish between those cases which are really simple, and those in which there is a complication of pulmonary tubercles: in the latter case the disorder may pass into phthisis; in fact, it is then only one of the modes of attack of the latter disease.

ASTHENIC PNEUMONIA.

Inflammation of the lungs does not necessarily assume the

sthenic form; it may be connected with symptoms of depression, which may either come on from the beginning or at an after-part of the disease. In the third stage this naturally occurs to a certain extent; that is, when the suppuration has extended to a considerable portion of the lung, the patient sinks into a prostrate or asthenic condition, very different from the false or apparent prostration which may arise very early in ordinary pneumonia from the dyspnœa produced by the extension of the inflammation to a large surface. But the secondary asthenia is not altogether similar in its symptoms to that which occurs much earlier in the disorder, and in its progress differs altogether from it.

The causes which render pneumonia asthenic at the earlier stages of the disorder may be referred to three classes: advanced age, previously enfeebled health, and certain epidemic causes which are not known. Neglect and exposure to continued cold favour the transformation of ordinary pneumonia into this variety, and have some influence over it at the beginning.

The local signs and the expectoration of asthenic pneumonia do not differ from those of the inflammatory variety, except that as it passes more quickly into the suppurative stage there is but little viscid expectoration; it very soon takes on the characters of the third stage, and in some cases the viscid inflammatory sputa are totally absent. There are, however, many exceptions to this rule, and the sputa are sometimes perfectly well characterized, and similar to those in ordinary pneumonia.

The general symptoms are more unlike those of ordinary inflammation: instead of the forcible pulse, and the active excitement of the capillaries, there is a feeble pulse, a diminished action in the smaller vessels, and a rapid sinking of the strength. In the worst cases the prostration is as great as in the typhoid varieties of fever, and the pneumonia is then frequently termed pneumonia typhoides. The epidemics of asthenic pneumonia are often of this character, and the disease is then extremely fatal. This is especially the case with the disease when it occurs among soldiers, who are much exposed to its causes. Gangrene of the lung frequently supervenes in the third stage of this variety of pneumonia; and in all cases there is a close connection between

the two affections, so that it is often extremely difficult to draw the dividing line between them, unless the gangrenous sputa should make the case clear.

The treatment of asthenic pneumonia is a matter of much difficulty; general bleeding is almost never borne with advantage, and in most cases it is directly contra-indicated by the exhaustion of the patient; cupping or leeching is very often of benefit, and in all cases it is easy to try the effects of a small local abstraction of blood, and to abstain from it if its effects should be injurious; in general, this kind of depletion, if borne well, is in such cases of decided benefit. If either the local abstraction of blood should not be tolerated, or the disease should continue but little improved after the patient has been cupped, blisters must be applied; they are much more certain in their action than in ordinary pneumonia, and may be used much earlier. The blister often requires to be re-applied if the part should heal very soon, or a new one may be placed over an adjacent part of the thorax. Other contra-irritants, such as sinapisms, are of more benefit as general stimulants to the nervous system, than as revulsives against the pneumonia.

The internal remedies demand more attention—it is often very difficult to determine upon their administration—they must be prescribed and again discontinued according to the state of the patients strength, and the degree of the oppression under which he suffers. Antimony should, as a general rule, be forbidden; but there are some cases in which the inflammatory action is acute enough to justify a recourse to this remedy,—that is, in small doses; in large quantities, it is always of danger. The times for its administration must be carefully chosen. It should never be given if there is much sweating, or a small and feeble pulse. The combination of opium, calomel, and ipecacuanha, is much more frequently prescribed, and as a general rule it answers well. The dose may be varied in this form of the disease, just as it is in the advanced stages of ordinary pneumonia; and the opium should be given in minute proportions, not exceeding one grain, or at most a grain and a half in twenty-four hours. In a considerable number of cases I exclude the opium altogether,—that is, if there should be much oppression and difficulty of expectoration.

The stimulating expectorants, and in some cases even wine, or stronger stimulants, are useful, and even necessary, in this disorder. The senega and eupatorium may be given at first nearly in the same doses as in the third stage of ordinary pneumonia; but they are, in some cases, tolerated for a very short period before it becomes necessary to substitute for them the milder alcoholic preparations, with some nutritious food,—that is, either wine whey, or, in a few extreme cases, milk punch.

In the form of pneumonia which occurs in persons of intemperate habits, and is nearly always asthenic, alcoholic stimulants are often indispensable; this is especially the case if the inflammation should be complicated with delirium tremens. If stimulants be omitted in this class of individuals, the mortality of the disease will be very great; but if they be combined with local depletion and blistering the local inflammation will be relieved, while the nervous asthenia which is so apt to occur in these persons may be prevented.

Carbonate of ammonia is another remedy which is often of extreme importance in this disorder; it is peculiarly adapted to those cases in which the secretion into the tubes is considerable, and the patient expectorates with difficulty. It may often be combined with small doses of ether, or Hoffman's anodyne. The usual dose is five grains of carbonate of ammonia, and from twenty to fifty drops of the ethereal preparation, every two hours; when the depression is very great, the medicine may for a short time be given even in larger doses.

Asthenic pneumonia sometimes prevails as an epidemic, and is attended with so much prostration of strength and alteration of the blood, that it has received the name of typhoid pneumonia, or even of typhus fever. These cases require more decided stimulation than those of the same variety in which the inflammatory symptoms predominate over the general feebleness, and will often scarcely bear even the local abstraction of blood. Blisters, with stimulating expectorants, especially ammonia, and sometimes wine, or other alcoholic preparations, become necessary.

LOBULAR PNEUMONIA, OR PNEUMONIA OF YOUNG CHILDREN.

These terms are used as nearly synonymous, although lobular pneumonia is not strictly confined to children. It is, however, much more frequent in them than in adults. It differs from the ordinary pneumonia both in its progress and pathological conditions. Instead of the disease occurring in one lung, and in a limited portion of the tissue, it is scattered over a large extent, and throughout both lungs, but it attacks isolated lobules, leaving for a time the intermediate tissue in a healthy state; these inflamed lobules become more and more numerous, until the greater part of the parenchyma is gradually consolidated. It is this progress of the disease which gives to it the term lobular pneumonia; the lobules affected are chiefly at the posterior part of the lung, for the gravitation of the blood towards this portion seems to favour the development of the disease in its cellular structure.

The appearance of the tissue is different from that of ordinary pneumonia; it is much darker, harder, smoother, and imperfectly granulated; it rarely presents the characters of the third stage, passing with difficulty to purulent secretion. The pleura covering the hardened tissue is sometimes but not always inflamed, and if but few lobules are attacked there is little or no accompanying pleurisy. Sometimes, indeed, the disease is hardly inflammatory, the lungs becoming passively congested, and of a deep red or brown colour. This is especially the case when the children have been long very feeble, or have laboured under another disease before the pneumonia begins. The disease is rarely confined to a single lung; both are almost always attacked, but the right lung at an earlier period and to a greater degree than the left. The bronchial tubes are much more frequently inflamed than the pleura; they contain the usual viscid mucus of the bronchitis of children.

The affection of the bronchial tubes is often the first step in the series of diseased actions constituting lobular pneumonia, and the induration of the lungs follows at various periods of time after the commencement of the bronchitis. The induration

then appears first at the posterior portion of the lungs, and surrounds the smaller and more numerous tubes; it thence advances gradually towards the anterior part. In other cases the induration of the lung takes place very rapidly, after the impression of cold or some other cause of pulmonary congestion. The difference in the mode of attack naturally establishes two varieties of lobular pneumonia; one is acute and primary, the other more chronic, or at least less acute, and secondary to bronchitis or to some general disorder of the economy.

In either case the symptoms of the disease are nearly the same. The physical signs are at first merely those of the ordinary bronchitis of children; that is, a sub-crepitant or mucous rhonchus, the percussion remaining at first clear, but gradually becoming dull as the disease advances. The dulness is not confined to one side of the chest, as in ordinary pneumonia, but is nearly equal on both sides; hence it is difficult to draw the line of distinction between the sound and that yielded by a healthy lung. The only method of doing this is to fix in the mind a correct idea of the average sound yielded by the healthy chest in children of the age of the patient, and then to institute the comparison. The dulness does not, in the majority of cases, pass into complete flatness, for there is rarely a perfect consolidation of the parenchyma. The respiration is also in most cases not completely bronchial, for the same reason that the percussion does not often become perfectly flat; but it approaches this character more and more nearly as the disease advances, and sometimes offers it to a very decided degree. Previously to reaching this stage, however, it assumes several intermediate changes, becoming gradually harsh and incomplete.

The other signs of this affection do not differ from those of ordinary bronchitis of children; there is in both cases cough, but no expectoration, and the dyspnœa gradually increases as the disease advances from point to point of the lung. There is fever, which is sometimes intense; and the disturbance of the circulation extends to the capillaries, which are much congested, especially those of the face, where the redness is in the early stages of the disease extremely marked, forming circumscribed patches on each cheek. This peculiar colour, with the dilatation

of the nostrils caused by the dyspnœa, forms one of the best indications of the disease.

The accidental symptoms are those connected with the abdomen and brain; these are, from their nature, very variable. There is almost always more or less disturbance of the digestive functions; sometimes vomiting, and either diarrhœa or constipation. The very irregularity of these symptoms proves their little importance for the diagnosis, and that they are only of value in the prognosis of the disorder. The cerebral symptoms are more constant; the obstruction to the circulation necessarily produces congestion of the brain, which is shown by decided stupor. In bad cases this passes into coma, or even active delirium. Now, if these cerebral symptoms become extremely severe, they may to a great extent conceal the pectoral signs; for cerebral disorder produces, as its inevitable consequence, a more or less complete obliteration of the symptoms of other organs, or at least it causes a decided diminution of them.

The diagnosis of this disease is obvious enough from the symptoms which I have described, excepting in one respect. As it arises insensibly during the course of bronchitis, there is no precise dividing line between the two disorders. In practice this is of but little moment, for when these diseases approach so nearly, they generally require a treatment which differs but little. There is also a difficulty as regard the diagnosis with one other disease—that of tubercles in the lung; these begin nearly in the same way as lobular pneumonia, and the local as well as the strictly physical signs are very similar. At first they cannot always be distinguished with entire certainty; but, after a short period, the softening of the tubercular matter will render the distinction very clear. The prognosis in this variety of pneumonia is, as a general rule, favourable in its early stages; and, indeed, in all cases where it occurs as an acute disease, but is not from the commencement sufficiently severe to cause extreme dyspnœa. In those cases which are strictly secondary, and succeed to chronic—exhausting diseases—the enfeebled state of the patient's health renders the probability of recovery much less. Under all circumstances the disease is attended with more danger

than ordinary acute pneumonia, which is very rarely fatal in children more advanced in age, in whom it often occurs.

The treatment of lobular pneumonia varies according to the manner in which the disorder commences. If it begin as an acute disease, with much oppression, and other evidences of high excitement from the beginning, it may require active treatment, —that is venesection in a few cases, and very frequently leeching to the chest; these remedies are not, however, in most cases imperatively necessary, but they relieve the patient more rapidly and certainly than any other. Bloodletting, in any form, is to be avoided, as a general rule, in cases of the lobular pneumonia of children; and it is only in those stages of inflammation in which the natural secretory efforts of the system seem to be insufficient for its relief, that it should be resorted to. The external revulsive remedies are to a certain extent useful in this form of pneumonia, but are less so than in the same disease as it occurs in adults; hence blisters, and other depletory revulsives, although they do relieve, are rarely of benefit until the advanced stages of the pneumonia, and even then are uncertain. Revulsives that act upon a larger surface, and at the same time are slightly stimulating, are much better: such as large mustard poultices. These should be applied not only to the thorax, but also to the lower extremities, especially to the soles of the feet and ankles. A convenient way of making them is to soak thick pieces of bread in hot vinegar, and to sprinkle them with mustard. In the declining stage, or in the milder forms of the disorder, a simple onion or garlic poultice is an excellent application.

The natural cure of lobular pneumonia is, like that of bronchitis, by secretion from the bronchial membrane; hence, in mild cases of the disease, nothing more is required than to prevent everything that may have an injurious influence with the use of a few simple remedies, which may favour the natural tendency to bronchial secretion. These are the wine of ipecacuanha, graduated so as to keep just within the point of exciting nausea, either given alone or with a slightly stimulating expectorant; of these, one of the best and most simple is the domestic syrup of onions, or the lac assafœtidæ. If the mucus becomes very abundant in the bronchial tubes it will often much relieve the patient to increase

the ipecacuanha to a dose sufficient to produce vomiting. There is, however, in general, little difficulty on that score,—for the tendency to vomiting is in these cases so great that very small doses of ipecacuanha will excite it, or it may occur spontaneously. Vomiting is of course to be avoided if the congestion of the lung should extend over a large portion of the parenchyma.

Tartar emetic may be substituted for ipecacuanha if there is much fever; but it is not, as a general rule, equal to this remedy, nor is it as safe. Still, there is no important objection to it, provided it be given in small doses to produce a secretory rather than a contra-stimulant effect. The other expectorants to which I have alluded under the head of bronchitis are often advisable in lobular pneumonia; but the rules for their employment present nothing remarkable.

There is a hygienic precaution which is essential both in acute and chronic lobular pneumonia: the child should never be allowed to remain long upon its back, nor, if the disease be severe, should it be permitted to sleep more than half an hour at a time. If this be neglected, the congestion of the lungs is greatly favoured, and the disease may prove unexpectedly fatal. The child should be gently carried about, or allowed to sit up in bed, or be simply inclined a little towards one side or the other.

It is evident, therefore, that lobular pneumonia differs chiefly from the ordinary disease in its seat, and in its frequently assuming more of the congestive than inflammatory form. But there are many exceptions to this when the circulation is excited, and decided depletory means are indicated.

PNEUMONIA OF THE AGED, AND LATENT PNEUMONIA.

In old age, as in early childhood, pneumonia assumes certain peculiar characters, but in the former case it approaches more nearly to certain stages of ordinary pneumonia. The only important difference is the great tendency of the disease to become latent, that is, to lose the ordinary functional signs of the acute inflammation, and to offer merely the feebleness and prostration which occur in most severe diseases, with little cough and little

or no expectoration. Hence, the disease is often scarcely suspected, and in a number of cases it is not recognised unless the obscurity of the general symptoms and the dusky purple tint of the face should lead the physician to explore the chest.

When the disease is not strictly latent, it is never so well marked by the ordinary pectoral symptoms as in more vigorous individuals, and passes rapidly through the first and second stages to suppuration. This peculiarity leaves little room, or at least but a short space of time for antiphlogistic treatment, and obliges us to resort at a comparatively early period to the more stimulating remedies which are appropriated to the third stage. At the commencement, however, the antiphlogistic treatment is directly indicated, and may sometimes be pushed with nearly the same vigour as in younger persons; but the period for this is short, and sometimes from the first hardly discernible.

SECONDARY AND INTERCURRENT PNEUMONIA.

Pneumonia is naturally enough of common occurrence as a sequel to many diseases of the lungs, especially bronchitis and consumption. In the former case the original disease is in a great degree absorbed by the more severe but secondary affection; but in the latter the inflammation will go through its stages, and leaves the tubercles nearly as they were at the first. This is, however, not always the case; even if the tubercles are not advanced their progress is occasionally hastened by the pneumonia, and after an attack of this kind we often find that gurgling or crackling is heard when there was merely a slight bronchial respiration previously to the pneumonia. In more advanced cases the pneumonia is not unfrequently the immediate cause of death by invading the portions of the lungs which remained free from tubercles, and were therefore essential for respiration. The inflammation may also form an exciting cause of new tubercles in a portion of the lung of a consumptive, or may give rise to them in one previously free from them, but of a tuberculous predisposition. In this case the gray granulations are found thickly disseminated through the part most inflamed,

and are evidently of recent origin. If there be not, however, a strong tendency to this disease, pneumonia has less influence in developing tubercles than pleurisy, notwithstanding there seems to be a more natural connection between the former disease and phthisis.

There is nothing peculiar in the management of these complicated cases, except that they bear a less decided antiphlogistic treatment than pure pneumonia, and mercurials must be used more sparingly. The rules for their management are essentially the same as those which I have already laid down.

CHAPTER XII.

GANGRENE OF THE LUNGS—PATHOLOGICAL LESIONS—SYMPTOMS—CAUSES—DIAGNOSIS—TREATMENT.

THERE is a disease which though not very frequently met with requires a notice in this place; I refer to gangrene of the lungs. This, like gangrene in other parts of the body, may occur either as a primary or secondary affection. When primary it is probably owing to an alteration in the condition of the blood, which being rendered unfit for nutrition can no longer support the vitality of the parts. It occurs as a secondary affection in cases of asthenic pneumonia. The anatomical characters of the gangrene are nearly the same in both forms, although when it is in its secondary form the tissue is at first hard and congested, and is seated in the midst of an inflamed parenchyma, while, in the primary form, it is at first merely infiltrated with a thin serous liquid, which is evidently an exudation depending upon the incipient gangrene, and gives rise to the fœtor of the breath met with even in the first stage of the affection.

In the second stage the tissue begins to break down, and gangrenous matter is expectorated; next the bronchial tubes slough off, and nothing is left in a sound state but the vessels; these resist the destructive process for a long time; and on examination after death they are usually seen traversing the cavity; however, after awhile, they too are destroyed, and their destruction sometimes gives rise to a hemorrhage which destroys the patient, although generally the blood has ceased to circulate through them before they slough, and little or no hemorrhage ensues. The sputa and breath in this stage of the disease are pathognomonic; they are both exceedingly fœtid, and the disease can, on this account, be easily distinguished from any other.

There are two principal varieties of the gangrenous sputa; one consists of a dark thin liquid, which somewhat resembles tobacco juice, or the infusion of liquorice, occasionally containing small pieces of black, gangrenous lung; the other consists of a grayish-yellow pasty fluid, which is probably a mixture of pus and gangrenous liquid. The latter occurs most frequently in cases following pneumonia; both, however, are extremely fœtid, though the odour differs slightly. In some cases of phthisis the sputa resemble the second variety, and it is probable that in these cases the tuberculous portion of the lung becomes gangrenous.

The third stage begins with the formation of a cavity, which continues to increase for some time, and may go so far as to involve a lobe, or even nearly the whole of one lung. After the formation of the cavity, the sputa are nearly the same, consisting of a thin, fœtid liquid, frequently stained with blood, which flows from the sphacelated vessels. When the case terminates fatally, the sputa increase in quantity, and the patient gradually sinks until he is completely exhausted, and death ensues. But when the disease terminates favourably, the following changes take place:—the gangrenous portion of the lung is first circumscribed by a membrane which separates it from the surrounding healthy tissue. As the gangrenous portion sloughs away this membrane is left as a lining to the cavity, and secretes pus; therefore, we find the latter fluid at first mixed with the gangrenous sputa, and supplanting it entirely when the whole of the diseased portion has been removed. As the inflammation subsides, the membrane assumes the character of a mucous membrane, and at last becomes similar to that lining the smaller tubes and air-vesicles, resembling very closely the serous membranes in the delicacy of its texture. If the cavity ceases to communicate with the bronchi, the lining membrane being no longer exposed to the stimulus of the air loses its mucous character entirely, and we then find a cyst lined with a membrane which is almost serous, and nearly similar to that found in the brain and elsewhere after cicatrisation; this may continue during the remainder of the existence of the individual, or be gradually obliterated by the formation of cellular tissue. After the entire cure of the gangrene the whole tissue which was in-

volved in the disease becomes more or less dense, and contains less than the natural proportion of air.

Symptoms.—The local signs of this disease are the cough, expectoration, and fœtor of breath. The cough at first resembles that of ordinary catarrh, but as the disease advances it becomes looser and paroxysmal in its character, a change which is produced by the accumulation of fluid in the bronchial tubes requiring a violent effort to throw it off. The effort ceases as soon as this is accomplished, and the paroxysm does not recur until the accumulation of fluid again renders this discharge necessary. These fits of coughing are often extremely distressing to the patient.

The physical signs are, in the first stage, feeble respiration and a moist rhonchus, generally either the mucous or sub-crepitant; the percussion is either natural or a little dull. The signs are not, therefore, characteristic.

As the disease advances we find the usual signs of a cavity, viz.: cavernous respiration, a loose gurgling and cavernous resonance of the voice, or pectoriloquy; the last, however, is not so clear as in phthisis, unless the cavity should be large and near the surface of the lung, for the quantity of liquid in the cavity, and the softness of its parietes, deaden the resonance. When cicatrisation takes place we find merely feebleness of respiration, which gradually diminishes but does not entirely disappear after the patient entirely recovers. In a remarkable case which I attended some years ago, the respiratory sound became nearly as clear as in health after the patient had been for nine months perfectly restored, but for a long time previously it had remained feeble, and more or less bronchial. If the liquid is discharged from the cavity in its early stages, the cavernous respiration and attendant pectoriloquy are rendered much clearer, but they are generally less loud than in cases of pulmonary phthisis.

The general signs are the following: there is usually considerable fever during the progress of the disease, with a small, frequent, irritable pulse; sometimes the pulse is exceedingly feeble. The fever is only important as it is connected with the prognosis, which is very unfavourable when the fever is high, and the gangrene is advancing; but if the disease does not make much pro-

gress the fever is less severe. There is an almost complete loss of appetite, produced by the nauseating character of the gangrenous liquid which is swallowed by the patient, who often has diarrhœa from the same cause. The skin is pale, and usually lead-coloured in the advanced stage, as is observed in almost all cases of gangrene, whatever part of the body may be affected. Very often there is extreme dyspnœa.

Prognosis.—As an average result about one half of those attacked will die. In hospitals the mortality is rather greater, amounting to three-fifths, while in private practice it is probably about two-fifths.

Diagnosis.—The only pathognomonic characters of gangrene are the fœtid breath and expectoration of the patient. When these occur as an acute disorder, or supervene suddenly upon a chronic one, they are quite characteristic of the disease. If they occur slowly, and continue for a long period, they may depend upon a vitiated secretion of the bronchial membrane, caused by chronic bronchitis; this either never occurs in acute inflammations of the lungs, or is so rare as not to be taken into the account. Numerous as are the cases of gangrene which I have met with in hospital practice, I do not recollect a case in which the fœtid sputa came from simple acute bronchitis. The other signs of the disease are common to it and some other affections of the lungs: but the rapidity of the softening, and the formation of a large cavity in a short period, occurs so seldom except from gangrene, that these signs are very good indications of the disease.

Causes.—The proximate, and at times mainly predisposing cause of this affection, is an altered condition of the blood; it becomes thin, and probably is vitiated in some unknown manner, which frequently coincides with a local inflammation. The ultimate causes are intemperance, indulgence in food of an innutritious nature, and any circumstances which break down the strength of the patient and thus predispose to gangrene. An attack of some acute disease, most frequently pneumonia, is the immediate exciting cause in rather more than half the cases: in others, the disease is in its origin a general one, and arises from the fluids alone; that is, from such an alteration of these as tend to gangrene. Gangrene of the lungs at

times follows that of other parts of the body, and is then strictly a secondary disease.

Treatment.—This is not in most cases antiphlogistic, but supporting in its character—tonics and stimulants being required. When you detect the occurrence of gangrene you must use all the means that you possess to support the strength of the patient, who is in a short time very much prostrated; for this purpose you must administer stimulants and tonics, with the free use of porter, wine, and nutritious food. This is the best and almost only mode of treatment. There is a remedy, however, which I have used in addition, and, I think, with some benefit, viz., chlorine; I give from ten to twenty drops of the solution of the chloride of soda every three or four hours; if, however, there is disposition to diarrhœa in the patient, he will bear very little of it. In addition to the internal use of chlorine, I place near the patient's bed vessels containing chloride of lime, which adds much to the comfort of the patient and his attendants. Opium is necessary in some cases of gangrene of the lungs to check the violent paroxysms which return so frequently as to fatigue the patient extremely; but it should be given sparingly, for it has the disadvantage of checking the secretions of the lungs; hence, it should be administered in the smallest possible quantity, and even then may be combined with senega and ipecacuanha, unless the nausea should be excessive. Blisters should be applied in those cases in which the gangrenous action is developed by a portion of the lung which has been inflamed; and in some ordinary cases, in which the inflammation is more developed than usual, we may also apply cups to the chest in addition to the general treatment of gangrene. We must, however, as a general rule, abstain from all abstraction of blood when gangrene occurs, except in those cases in which the gangrene follows inflammation and seems to be in part at least caused by it.

The indications for the treatment of gangrene are, therefore, extremely simple; a generous, supporting diet and treatment, with blisters, and, in a few cases, cupping to the chest, to check the intercurrent and accompanying inflammation, constitute our main reliance, but the chances of success are greatly increased

by the accessary remedies, some of which I have mentioned. The absolute antiphlogistic treatment is decidedly bad; and of the remedies which are classed under this head, none is more positively mischievous than mercury and its various preparations.

CHAPTER XIII.

TUBERCULOUS PHTHISIS—NATURE OF THE DISEASE—ANATOMICAL CHARACTERS—MODE OF ATTACK—CAUSES—SYMPTOMS—PHYSICAL SIGNS—DIAGNOSIS—PROGNOSIS—TREATMENT.

TUBERCULOUS PHTHISIS, or consumption of the lungs, is the most formidable disease of the thorax; that is, a much greater number of individuals fall victims to it than to any other affection. It is natural, therefore, that we should study the disease with attention, and we should strive to acquire the means of detecting it in that early stage when treatment is often of decided benefit. In the later stages, unfortunately, we do not possess the means of arresting the progress of the disease; we can, it is true, to a certain extent modify the symptoms, and thus alleviate the sufferings of the patient, but we can only in a few cases contribute to positive recovery. Even in these few instances we do not possess the same controlling influence as in many other diseases, but we must limit ourselves to acting strictly as the handmaids of nature, and aiding the process of cure which she institutes. It is possible that our power of control will be greater when the intimate pathology of the disease is more thoroughly understood, and the circumstances which favour the formation of tuberculous matter are completely known; but at present we are too often obliged to confess that our art is comparatively powerless in arresting so fatal a disease as pulmonary consumption.

Consumption of the lungs is frequently regarded merely as a local disorder, but although the chief lesions are seated in the pulmonary organs, the essential characters of the disease depend much more upon its diffusion through the whole body than upon the local mischief, which is often comparatively slight.

The cause of the fatal termination is sometimes to be found in the local lesions, and the secondary exhaustion and irritation caused by them; and at other times in the general disorder which attends both the earlier and latter stages of pulmonary consumption.

Hence, consumption is to a great extent a complex disorder, and must be regarded in two distinct points of view; which must be kept steadily in mind, not only in the diagnosis but the treatment of the disease. On the one hand there is a local mischief which is often accompanied with inflammatory symptoms, and on the other there is a vicious or diseased action going on in the whole economy, which is brought especially into play in the lungs, but is rarely confined to these organs. This diseased condition of the whole body has received different names; by some it is called the tubercular diathesis or cachexia, and by others the scrofulous constitution; but when the latent mischief is brought into action, it then receives a name from the organ which is most decidedly attacked, and the original predisposition is almost lost sight of. Hence the tubercular diathesis, that is, the general disorder, may be developed to a very intense degree, and yet the local mischief may be slight, and tubercles may be scattered over a large number of organs. In these cases it is difficult to say whether the disease should be called pulmonary phthisis or not, for the disease of the lungs scarcely preponderates over that of the rest of the body, and the seat of the disorder is to be looked for in the fluids rather than in the solid tissues. At most, the affection of the lungs is important in such cases as a sign of the general disorder, not as a disease in itself; and the only means we possess of modifying the progress of the affection, consist in such remedies as are essentially general in their nature.

In other cases the pulmonary affection either begins as the earliest point of the disorder, or it occurs very early in the disease; and the functional disturbance of the lungs becomes so considerable that it necessarily attracts a large share of attention. This is the case in a large proportion of tubercular diseases, especially amongst adults, in whom the lungs are not only the part which in most cases is earliest attacked, but it is

that which is most deeply affected, and becomes the seat of the most extensive lesion. Just in proportion to the early appearance of these lesions, and to their inflammatory character, does the disease participate more in the characters of a local, and less in those of a general disorder; still the latter part of the affection must in no case be lost sight of. Even in those cases which are most inflammatory, and which differ least from pneumonia, there is something more than a common inflammation; for a secretion of tuberculous matter is added to the ordinary products of inflammation, and this secretion implies a peculiarity of constitution, either congenital or acquired, in the patient. If this peculiarity did. not exist it would be an ordinary local disease, which it evidently is not, either as regards its symptoms or lesions.

The essential character, then, of pulmonary consumption is, that tuberculous matter should be deposited in the lungs, and the disease may begin with the local mischief, or this may take place as an evident sequel to the constitutional disorder. But in both these varieties the constitutional mischief is present, and the evidence of this consists mainly in the formation of the tuberculous matter. It is very clear, however, that the mere presence of tubercles does not constitute the disease, and we must avoid falling into an error into which the exclusive study of pathological anatomy might lead us. The disease is essentially a morbid condition which either precedes for a long time the formation of tubercle, or it is more acute in its character, and is then accompanied or quickly followed by this product; the local diseases which often precede tuberculous formations being, as we have often seen, merely an exciting cause of them.

It is now agreed to restrict the term consumption of the lungs to the cases in which there are tubercles, although it was at one time used as synonymous with all chronic diseases of the lungs attended with emaciation, which of course included chronic bronchitis as well as chronic pleurisy.

Tubercle is the same in all its essential characters, in whatever part of the body it may be formed. It consists of a white opaque or yellowish body which increases to a moderate size, rarely larger than that of a large almond, and generally much

smaller, when it begins to soften, and is finally converted into a very thick pasty yellowish liquid, of a dull yellow colour, and heavy but not fœtid smell. As soon as this softening takes place, the delicate cellular membrane which always encloses tubercle like other morbid products of an analogous kind begins to assume the characters of a pus-secreting membrane, and becomes thicker; ulceration of some portion of it finally takes place, and the matter finds its way towards the exterior of the body, generally by means of a mucous tube. At first, tubercles appear under several different forms, either that of a yellow opaque granulation, or of a greyish semi-transparent one; in either case they are rounded, probably from the pressure of the adjoining tissues. In other cases the part affected is infiltrated with a greyish semi-transparent liquid, which does not at first reveal its peculiar structure; little by little the original tissue disappears, and it is gradually absorbed as the quantity of the new substance increases. This infiltrated tuberculous matter is not always of a greyish semi-transparent colour; in some cases it is yellow and opaque from the very commencement, but in the greater number it passes through the changes of colour just described; these are accompanied with a corresponding change in the intimate structure of tubercle; it becomes more granular, more fragile, and less perfectly animalized. But in both cases the essential constituents of tubercle are the same, consisting chiefly of albumen, with a small portion of the salts of lime. There is, therefore, nothing peculiar in the chemical composition of tubercle, its characters depend upon its tendency to increase and finally to soften, and on the diseased condition of the whole economy which is necessary to its production.

The gradual changes which occur in its structure give rise to peculiar symptoms which are secondary to the disease properly so called. Hence in the study of tuberculous disease in general, but especially in that of the lung, we have two sets of symptoms, one being primitive, and the other secondary, and not directly so much connected with the disease as with its effects. The patient may perish from either cause.

Although in its regular progress tuberculous matter ends in

softening, and in the formation of a pus-secreting cavity, this is not a necessary or invariable consequence. In many cases the tubercle ceases to increase after it has attained to a certain size, and becomes harder and drier; the earthy matter increases in quantity, and a calcareous mass is left in place of the tubercle, and is surrounded by a membrane; in such cases the secondary symptoms are either wanting, or are very slight. In a smaller proportion of cases the tubercles do not even advance so far, but are actually absorbed; this fact is difficult to prove, because tubercles are not in their earliest stages susceptible of physical demonstration, but there is every reason to admit it, for patients who have laboured under the decided symptoms of commencing phthisis, have on the one hand recovered, and on the other hand they have passed into the more advanced stage of the disease. We have, however, more direct proof of the curability of tubercle. That is the evidence derived from pathological examination, and of this there is no more striking illustration than the case of an eminent physician of this city, the late Dr. Parrish. It is well known that he regarded himself as labouring under pulmonary consumption at an early period of life; he recovered vigorous health, lived to the age of sixty, and finally died of a disease of the kidneys. In his case there was undoubted evidence not merely of the previous existence of phthisis, but of its absolute cure. At the summit of each lung were cicatrices and deposits of calcareous matter, proving that some portion of the tuberculous matter had passed to the state of softening, and that another portion has become dry and indurated. We learn from pathology that the more advanced tubercles are almost never met with, unless some grey granulations or incipient tubercles are found at the same time scattered amongst or around the larger tubercles; hence the inference is very conclusive, that the granulations had disappeared in those cases in which, although there are evident indications of the larger tubercles in the cicatrices and in the calcareous matter, no trace exists of the granulations. Their cure probably takes place by absorption.

Phthisis is therefore strictly a curable disease, notwithstanding that in the majority of cases it terminates fatally at an earlier

or later period. This arises not so much from the effects of the first crop of tubercles as from the successive deposits of new ones in different parts of the lung, and indeed of the whole body or rather from the accompanying fever and irritation. Hence a patient rarely dies of one attack of phthisis, except it be of a very acute form.

Anatomical characters.—These have been already described to a certain extent. As they essentially consist in the deposit and formation of tubercles little need be added. The most frequent variety of tubercle in the lungs is that which commences by gray granulation, and gradually passes into a more developed stage: but the infiltrated tubercle is also extremely common, although rarely found alone, that is, without the gray granulations. Both of these varieties begin at the summit of the lungs in the majority of cases, and are found with nearly equal frequency on the two sides. In other cases the tubercles are formed in a different way, that is, at the middle or lower portion of the organ, and they then begin more frequently as the formed tubercle, without being preceded by the gray granulation; this is particularly the case where the general health of the patient is much vitiated, and the fluids of the body are much altered. In the latter case the tuberculous matter is softer, and less perfectly eliminated: but it passes more rapidly through its course, and is, therefore, dependent upon a more severe form of the disease.

After the tubercles have attained a certain size, which is generally that of a very large pear, they begin to soften; but sometimes they reach a much larger size without the least apparent softening. The softening always begins near the centre and gradually passes to the circumference, until finally the softened mass is discharged through one of the nearest bronchial tubes. The cavity which is left is lined with a double membrane; one, the most internal, is soft and almost pultaceous in its appearance, and continues to secrete a thick tenacious liquid; the other is external to this, and is not always readily demonstrable. In fact it is scarcely a membrane, it is rather the tissue of the lung which is paler and more indurated than the subjacent structure. While the tubercles first formed begin to soften there are in the sur-

rounding parts of the lung other depositions of a similar kind, which gradually increase in size until they form masses, from the gradual adhesion which takes place between them. These tubercles finally soften and discharge themselves into the cavity which was first formed or through an adjacent bronchial tube. The new cavity becomes little by little merely a part of the one which was first formed; that is, the walls which separated them one from the other become gradually absorbed until a partition no longer remains between them, and the new cavity then becomes a part of the old, which gradually increases in size. Sometimes when the constitution of the patient is comparatively good, and there are but few depositions of tubercle in the rest of the body, the cavities, if they are confined to one lung, may attain a very large size, and not infrequently will occupy the space of the whole upper lobe, and sometimes a large portion of the lower, before the death of the patient.

The exact seat of pulmonary tubercle is difficult to point out. In fact, it is not always the same. In some cases, especially one variety, the tuberculous matter is evidently found adherent to the mucous membrane of the bronchial tubes and small vesicles; but the gray granulations follow the usual rule upon this subject, and are formed in the cellular tissue of the lungs, as in that of the pia mater or the spleen, and are nourished by distinct vessels distributed to each granulation. These granulations as they enlarge press upon the neighbouring vesicles, and gradually cause their atrophy, and finally give rise to absorption of the pulmonary tissue. The cysts are formed in the lungs, or in other organs, by the newly-developed cellular tissue around the tubercle; this gradually thickens as the softening advances, and, as I have already stated, when this is completed the cavity is then lined by a regular pus-secreting membrane.

The process of cicatrisation is nearly the same as in other cases of cavities in the lungs; as soon as the specific tuberculous matter is completely discharged there remains merely an ordinary cyst, which either becomes continuous with the mucous membrane of the bronchi, or is filled up by the deposition of cellular tissue. The calcareous deposits result apparently from a change in the

tuberculous matter, in which there is a gradual deposition of lime.

The condition of the surrounding tissues is very various. If the case occur as a purely constitutional disorder without previous local inflammation, the tissue remains pervious to the air, and nearly healthy; but if the inflammation either precedes the formation of tubercle, or follows its development, the tissue is indurated, and of many shades of colour from a light gray to a decidedly reddish tinge. At other times the tubercular matter is infiltrated through the pulmonary tissue, and gives rise to an appearance similar to that of inflammation. When the inflammation is of that kind which disposes to the formation of tubercle, —that is, when it occurs in an individual labouring under a highly developed tuberculous diathesis, the granulations are scattered abundantly through the most inflamed portion of the tissue, which in these cases is often nearly similar to the local congestions, or lobular apoplexy, which occur in connection with metatastic abscess of the lung. As this variety of phthisis is not so frequent as those in which the inflammation is comparatively slight or doubtful, the appearance is by no means a very usual one: on the contrary, in most cases, the lung is vesicular, and respiration is carried on in the immediate vicinity of the tuberculous matter.

When pulmonary phthisis is much advanced, and the cavities have become very large, they are usually found in both lungs, but in varying degrees. Thus, we generally find on one side amphoric or very cavernous respiration and gurgling, while on the other there is merely a moderate cavity indicated by slight pectoriloquy and crackling. Both lungs are not, however, usually affected in the same degree: one is almost always more diseased than the other; sometimes one is converted into a vast cavity, while the other contains merely a few scattered tubercles, which are almost always more abundant at the summit than at the bottom of the lungs. We generally find that pneumonia occurs frequently around the tubercles; and almost always there is a secondary pleurisy developed in proportion to the tuberculous deposit; that is, when tubercles are the most numerous, there are always found strong pleuritic adhesions. In some cases,

however, the inflammation of the pleura does not keep pace with the tuberculous disease of the lungs: these cases constitute one of the worst forms of the disease, as perforation of the lungs, and of course pneumothorax, are then apt to occur from softening of tubercles situated just beneath the pleura.

Besides the lungs the appendages of these organs are a common seat of the tuberculous deposit; particularly in those cases in which the disease is more general or diffused in its character. These are the serous tissues and the lymphatic glands at the root of the lungs, or, as they are called, bronchial glands. In children they are more frequently the seat of tubercle than the lungs themselves, and even in adults are a common seat of this deposit, though to a less extent. But the pleuræ are more important as a seat of tubercle; they are often deposited on the adherent surface of the membrane, causing little projections scattered abundantly over it; they are also very frequently formed in the thickness of the false membranes thrown out in the pleuræ. This subject belongs, however, more properly to the accompanying inflammations of phthisis. Tubercles are of course not confined to the thoracic organs; on the contrary, I have shown in the preliminary remarks, that the disease is eminently constitutional, and that, like all cachectic disorders, the development of the peculiar product in the organ primarily affected, favours its formation in other parts: and, therefore, many organs suffer from the same cause. Of these complications the most frequent, and perhaps most important, is the formation of tubercles in the follicles of the intestinal canal. At least, this is the most important consequence of advanced tuberculous disease of the lung, for although there are other diseases of the same kind in which the mischief is more considerable, they are not simple sequelæ of phthisis, but are earlier manifestations of tuberculous disease: the lungs generally remaining healthy until the other organs are attacked, or presenting but a few scattered tubercles, which develop themselves slowly. For a more full account of the relative frequency of tubercles, I must refer to Andral's Pathological Anatomy, in which the subject of tubercle is treated at some length. It is, however, imperfect, because it is founded upon observations

made by physicians who were studying chiefly a single variety of tuberculous disease, or at least did not extend their observations to a sufficiently large number of subjects, or to a sufficient variety of age and condition.

In pulmonary phthisis there are numerous lesions of particular organs of the body which are to a great extent peculiar to the disease, although not entirely produced by the deposition of tuberculous matter. Sometimes these lesions prevent the full development of tubercles, and thus act as one of the causes of this morbid secretion; at other times they are strictly secondary, and in a great degree caused by it. Some of these lesions are strictly dependent upon the formation of tubercles in various parts of the body as the serous and mucous membranes, the spleen, liver, and in nearly every organ. Thus, we find tuberculous pleurisy, peritonitis, and meningitis, sometimes arising during the course of a protracted tuberculous consumption; and at other times they form the first morbid alteration, and the disease is called commonly chronic pleurisy, or peritonitis, or acute hydrocephalus. At the same time we regard these affections as differing merely in the organs of the body which happen to be in the first place most disordered from pulmonary phthisis. Sometimes these tuberculous diseases indeed occur in the course of pulmonary phthisis, and are then simply a lesion which is subsequent to this disease, but at other times they take place either in persons who are in perfect health, or who may have merely a slight deposit of tubercles in the lungs. Thus, tuberculous diseases are so closely connected with the inflammation of the organs in which they are situated that they may be readily mistaken for simple phlegmasiæ, from which their symptoms scarcely differ. At the same time the prognosis then becomes much more fatal than if it were a simple inflammatory disease.

Mode of attack.—Pulmonary phthisis, like other forms of tuberculous diseases, occurs either as an acute or chronic affection. A certain number of symptoms are common to both varieties; but others are peculiar to each, or at least are so much modified that it is difficult at times to recognise the identity of the two affections. The acute disease is attended by much febrile excitement, and by the general characters of an inflam-

matory affection. Indeed, it is either connected with an ordinary inflammation, or the secretion of the tuberculous substance itself is but little different from that process by which the common products of inflammation are formed. In the chronic disorder the alteration is not of an inflammatory, or even of an active secretory kind,—it is a slow change in the condition of the capillary vessels of the body.

Both the acute and chronic varieties may be attended with a local inflammatory action in the lungs, or may be almost entirely free from it. In the latter case the lungs are merely involved as a part of the general disorder which shows itself in these organs, from their structure being favourable to the tuberculous deposit. When the disease is complicated with local inflammation, this may precede, accompany, or follow the tuberculous secretion. In the acute variety, the inflammation generally attacks the serous membranes, and in the chronic the mucous, although this is not always the case, for the inflammation of any tissue of the lung may be closely connected with the abnormal formation. There has been much confusion of ideas on this subject from the great variety in the connection which often exists between inflammation and tubercle; this is very similar to the connection between the local disease and the general diathesis. Indeed, the complicating local disease is almost invariably of an inflammatory character, so that the question is at last almost narrowed down to this—is inflammation the cause of tubercles in the lungs, and we may also add of the body in the other organs, though this is not immediately connected with our subject? If we seek a reply to the naked question, we will be compelled to answer negatively,—but, if we modify it so as to apply it to those varying conditions which are continually occurring in the human body, it may be answered that it is one of the causes. That is, it will develop the disease very frequently in persons who present a strong tuberculous diathesis, and occasionally in those who do not. In the latter case especially, and to a certain extent in the former, it acts in two ways,—it is a direct disturber of the lungs, and a depressing agent upon the whole system. When inflammation occurs in this way before tubercles are positively developed, it may act as a predisposing

cause during its continuance, and the tuberculous affection then coincides with the inflammatory action, or it then may occur after the latter has terminated. It then acts chiefly as a disordering agent upon the general system, with a slight local determination of disease to the part. In the former case, the local action of the cause is the predominant one.

The inflammation of different tissues does not, as I have stated, exert an equal agency upon the development of tubercle. To understand this, we must analyse them separately.

1. First of the serous membranes. Pleurisy is perhaps the most active of all these inflammations. Like the others, it attacks individuals in good health, or labouring simply under a scrofulous diathesis (and tubercles are developed during the course of the inflammation, or soon afterwards), or it coincides with the rapid formation of tubercles, which are then usually formed at the same time in the pleura, the false membranes, and the lungs proper; or it may occur as a mere secondary inflammation after the tubercles are formed, or are even tolerably advanced; in the latter case the pleurisy is a healthy, or at least a preservative inflammation, designed to prevent perforation of the pleura. All these varieties may be properly classed under the head of tuberculous pleurisy.

The first variety is the most difficult to distinguish, because the disease does not at first differ from ordinary pleurisy, and the important complication may be overlooked. The signs of the pleurisy are either gradually mingled with those of the tuberculous disease, or at least they disappear when the symptoms of phthisis show themselves. In this case the pleuritic effusion is often extremely large, and the disease is then sometimes ascribed to the absorption of the empyema. The pus has undoubtedly an influence upon the formation of tubercles, but in most cases it acts merely as other causes of the disease,—that is, by producing an irritating action upon the part, and a general depressing influence on the whole body. The second variety is that in which tubercles are formed at the same time, and apparently by the same morbid action as the ordinary products of inflammation. The pleurisy is readily recognised; but the tuberculous complication can only be distinguished by

careful attention to its symptoms, and even then the diagnosis is but a probable one. In the last variety there is, of course, no difficulty in ascertaining the nature of the pleurisy.

2. Bronchitis and pneumonia occasionally occur amongst the earliest lesions in the acute forms of phthisis. The bronchitis is then of the common mucous kind, and rarely passes into tuberculous phthisis, except in those cases in which it is connected with a strongly-developed scrofulous diathesis. But the bronchial inflammation is extremely frequent as an early complication, coinciding with the first formation of tubercles, or following them. In the latter case it is most marked in the tubes which run through the clusters of tubercles, and it is then nothing but the ordinary secondary bronchitis, which gradually increases as the disease advances, and is most intense when softening has taken place, and the mucous membrane is irritated by the continual passage of the softened tubercles. Pneumonia is the least frequent of those local inflammations which act as determining causes of acute tubercles; it is rarely of the frank sthenic kind, but generally occurs in scattered lobules, bearing a close analogy to the lobular pneumonia of young children, or the variety of inflammation which attends the formation of metastatic abscess; it is, of course, difficult in these cases to decide, if the pneumonia is really antecedent to the tubercles, or occurs under the relation of a mere attendant, or even a secondary result.

In chronic cases of phthisis the preceding inflammation is often of the bronchial variety, a common chronic mucous catarrh passing by insensible shades into pulmonary phthisis,—that is, a time arrives when the secretion of tuberculous matter takes place, and the bronchitis is no longer simple. This is not, however, the only inflammation which proves a determining cause of the more chronic forms of phthisis; pleurisy not unfrequently produces a like result, especially in those cases where the effusion has been large. Pneumonia rarely produces the same result; indeed, this inflammation is, on the whole, remarkably independent of tubercle.

Phthisis without local inflammation at the commencement.—There is no doubt that many cases of phthisis, probably the

larger number, originate without being preceded, or even at first accompanied by local inflammation; when this occurs, it is strictly secondary to the tuberculous disease. These cases of the disease are sufficiently described in the commencement of this chapter, and in fact they do not differ from those of general or constitutional tuberculous disease, except in the predominance of the disorder of the lungs. They may therefore be latent for a considerable time, and only attract attention to the lungs when the disease is sufficiently advanced to produce some secondary inflammation. The principal symptoms of the disease are therefore those of the general tuberculous disorder, with or without the addition of the signs caused by the local mischief; these are not always developed sufficiently to attract much notice until the disease is quite decided. The mechanism of the pulmonary disorder, if such an expression can be used, merely consists in a direct secretion of tuberculous matter from the vessels, and it is sometimes connected with a diminished, instead of an increased vascular action in the part, although this is not invariably the case even at first, and is very seldom so after the disease is developed.

Causes.—When we remember the circumstances under which the disorder occurs, we may divide the causes of it into two classes —those of a general and those of a local character. The general causes are such as exist originally in the individual, or arise from the circumstances in which he is placed; the latter are those which may be to a great extent obviated by art, and the action of the former may thus be checked indirectly, or at least not favoured. The local causes of phthisis are either directly inflammatory, or at least belong to morbid conditions which must be removed by medicinal rather than by hygienic measures. If the general causes include an hereditary predisposition to tuberculous disease it is of course necessary to insist more strongly upon those that are accidental. We find these causes enumerated in the work of Dr. Clark, and in most others upon the subject, and it is not necessary to enter much into detail upon this subject; some classification, however, may be adopted, to render the same intelligible.

1. We may place hereditary predisposition in the first in-

stance. This is universally admitted, and the strength of it is increased if the parents were actually labouring under the formed disease at, or a short time previously to the birth of the child. It may descend from either parent; but it would seem that the mother exercises the greatest influence in this respect, especially if she nurses the child herself. In other respects the usual laws of hereditary transmission hold good, and the probabilities of their action are increased if the child present the signs of the scrofulous temperament.

2. Depressing causes which debilitate the powers of life increase the tendency to the morbid action. These, of course, are very numerous. Imperfect diet, exclusion from light, and from fresh air, and mental depression, are amongst the most powerful. Inaction, or a diminished activity of body, favours the same result. These causes are very obvious in patients admitted into hospitals with other chronic diseases, and afterwards attacked by phthisis. It is always important to protect the patient from the influence of these causes, and whenever practicable the greatest attention should be paid to them. One of the advantages of a journey certainly arises from its invigorating influence, and the abundant supply of healthful air which is thus obtained for the patient. The depressing causes often arise from the effects of a disease which is cured but leaves the patient in an enfeebled state; this is often the case with typhoid fever; in other instances it produces a more direct impression, and the phthisis supervenes before the fever entirely ceases.

3. Certain occupations are known by direct observation to favour the development of consumption; these are such as require a constrained position, and especially sedentary confinement in close rooms. Mineral or vegetable dust or powders diffused in the atmosphere contribute to the same result. Hence the propriety of changing the occupation of the patient is often a matter of strict necessity. Irregular exposure to cold and heat has a similar tendency, but it is much more effective as a cause of the accidental inflammations that often precede phthisis.

Although these are the chief of the general causes of phthisis, the list might be much extended; they are, however, more or

less analogous in their character, and more or less directly depressing upon the individual.

Symptoms.—Phthisis is, or soon becomes so complicated a disorder, that a constant analysis is necessary in the study of the symptoms. If these are regarded in a crude, general way, they are often extremely indistinct; hence, many writers upon the subject content themselves with the signs of the disease as fully established when diagnosis is no longer a matter of doubt, or they add to this the general characters which are usually described as designating the scrofulous temperament. But as the discoveries of Laennec prepared the way for a full understanding of the pathological characters of the advanced disease by a knowledge of the physical signs which attend them during life, physicians have not rested satisfied with this view of the subject, but have ascended, as it were, to the source of the affection, and have laboured to point out the initial steps, or at least the symptoms which occur very early in the disorder. Still you will find in many works on the subject, even of the most recent date, that the physical signs which occur sometimes quite late in the disease are brought forward as indicative of the earliest stage of the disorder, which in most cases they certainly are not. We are obliged, therefore, to divide the symptoms into several different classes, which will lead us naturally to the study of the connected or dependent diseases. 1. First we have a series of symptoms dependent upon the tubercular disease considered as a general disorder. 2. Symptoms connected necessarily with the development of tubercles in the lungs, including of course the physical signs of the disorder, properly so called. 3. Symptoms dependent upon the accessary disease of the lungs and air-passages, including the larynx and trachea, which are present to a greater or less degree, in nearly every case of the disease. 4. Symptoms of disorder of the organs, some of which depend upon a deposit of tubercle in the tissue, but for the most part they are connected either with a positive inflammation or a mere functional disorder; to a greater or less extent these take place in most instances of phthisis. We do not, of course, expect to meet these symptoms in every case of the disease; many of them may be obscure, and some absent entirely; but we do in

reality scarcely ever meet with a case in which they are all badly defined; that is, with a case of true latent phthisis. Cases in which the disease is so obscure as to be nearly latent are quite common.

1. *General symptoms common to phthisis and other tuberculous diseases.*—These differ in the acute and chronic varieties in degree, and to a certain extent in nature. In the acute variety a rapid deposit of tuberculous matter takes place, generally throughout a number of organs at the same time; this approaches very nearly to an inflammatory secretion, and it is attended with a general disturbance of the body, which differs little from inflammatory fever, especially the fever which attends a subacute inflammation of the pleura or other serous membranes. The pulse is extremely frequent, generally from one hundred to one hundred and thirty in the minute, quick and jerking; these characters are often difficult to define, but are at the same time very well marked. The febrile excitement is continued, and does not cease during the twenty-four hours, diminishing a little in the morning and becoming more intense toward the middle of the day; at night there is almost always sweating, which at times is extremely profuse, and as a general rule is abundant. Patients, however, are not always willing to admit that they have profuse sweats, especially at night; at least not in the early stage of phthisis. This unwillingness arises chiefly from a great indisposition on the part of the patient to confess that they have any symptoms commonly ascribed to phthisis. There are rarely chills; generally a mere sensation of chilliness at irregular times, and differing therefore from the chills of well-defined hectic which occur in the latter stages of phthisis. The accessory symptoms, or those connected with the alimentary canal, are strictly such as would be supposed to exist in cases of high fever, such as thirst, anorexia, and constipation; but they are less severe than in most instances of febrile excitement, because the stomach and bowels do not at all participate in the earlier disturbance of the system. The general appearance and countenance of the patient change when the fever is developed. The expression is restless,—the lips and countenance pale and flushed at irregular times,—the flush is often cir-

cumscribed when the fever is most considerable, but the tint is of a much lighter and at the same time a brighter red than in pneumonia. The flush is not peculiar to any one form of tuberculous fever, but occurs without reference to the part affected. Thus, it occurs in tubercular meningitis, pleurisy, and peritonitis; in these cases it is, however, generally less marked than in tuberculous disease of the lungs. The countenance is often indicative of much dyspnœa, with dilatation of the nostrils, if there be a very large and rapid secretion of tubercles. The emaciation is rapid, partly as a direct effect of the tuberculous disorder, and partly from the profuse sweats which rapidly enfeeble the patient. Sometimes the emaciation occurs as the very first symptoms of phthisis, and is afterwards followed by the fever and other signs of the disease. In some patients, however, there is not much emaciation, but simply a dusky or pallid hue of the complexion until the latter stages of the disease.

These signs, in themselves, although not positively pathognomonic of acute tuberculous disease, can scarcely occur in a high degree from any other cause. Although all cases of acute tuberculisation are not necessarily attended with them in their highest degree, we will find that they exist to a greater or less extent in nearly every case of the disorder, and that their value is much increased by the very slight development or entire absence of other lesions sufficient to account for the fever, especially if conjoined with one other character,—that is their presistence,—for this fever does not rapidly decline; on the contrary, it usually lasts for a considerable period, and besides resists all treatment. Pleurisy of a subacute character approaches very nearly to the febrile symptoms of acute phthisis, whether the pleurisy be complicated or not with tubercles; in fact, I have little doubt that the pathological condition of the economy which attends the formation of the lymph, and that of acute tuberculous disease, differ but very slightly from one another. This, however, is not sustained by a course of demonstrative reasoning, and therefore is of little interest until it is better developed. Reasoning by way of exclusion we may attach great importance to the tuberculous fever, especially when it cannot be accounted for by the existence of any other disease capable of producing it.

In the more chronic cases of phthisis the general signs of the disorder are more difficult to distinguish, because their development is slow and the fever in the early stages is comparatively unimportant. The signs which are most decided are those indicative of a deterioration of the constitution and of the nutrition. The skin of the patient is generally of a dull tint; or if his complexion be naturally very clear, and the capillary circulation extremely active, the cheeks are from time to time flushed with a circumscribed redness, not very unlike that of acute phthisis, but less decided. At the same period, those peculiarities which are supposed to indicate a scrofulous or tuberculous constitution are often more developed; that is, the blueness of the conjunctiva, and the rounded fusiform appearance of the ends of the fingers, which, although not peculiar to this condition of things, is certainly more common then than under any other circumstances. The moderately chronic cases are also accompanied with fever, which is often slight, and sometimes limited to a mere sensation of heat or burning at the palms of the hands and feet: the sensibility to cold is at the same time often much increased; but there is very rarely a distinct chill, except from inflammatory complication.

In short, the ordinary cases of phthisis offer as symptoms—emaciation and slight fever, with an increase of the peculiarities designating either a constitutional diathesis or a tendency to the disease from an original feebleness of constitution. The very chronic cases are more and more obscure as regards the general symptoms in proportion as the disease is slower in development. The addition of local signs of irritation confirms the value of the more chronic constitutional symptoms, as well as of the acute, provided these local symptoms do not disappear very readily.

Hectic fever is a very frequent consequence of tubercles after they have attained a certain stage of development,—not that the fever is peculiar to tubercles, but, on the contrary, it is common to all diseases attended with suppurating cavities communicating with the exterior. It scarcely occurs under other circumstances, —that is, the true hectic; the fever of irritation, on the contrary, is very frequent when no suppuration exists, and is then very

analogous to the initiatory fever of ordinary tuberculous disease. The true hectic occurs in the advanced stages of phthisis, when softening of tubercnlous matter has taken place, and a pus-secreting cavity is formed. It is characterized, as is well known, by a strong tendency to a regular paroxysmal type, which sometimes approaches closely to intermittent, by abundant sweats generally coming on at night, and by a pulse which is at least as frequent, but generally more compressible than that of an earlier irritative fever.

We may add to the general symptoms of phthisis the extreme exhaustion and tendency to œdema which occur in the latter stages of the disease. These, of course, are not peculiar to it.

2. *Symptoms directly dependent upon the development of tubercles in the lungs.*—The bronchial or other inflammations which occur very early in phthisis are not properly dependent upon this disorder if they precede it, but true secondary inflammation of the lungs is a necessary consequence of the tubercnlous deposit, and is strictly consecutive to it. The signs of the inflammation are of course scarcely different from those of ordinary bronchitis, and have been sufficiently noticed already; that is, if we restrict the term bronchitis to those cases in which the inflammation extends over a large surface, and is in itself tolerably severe; but if the slighter cases of bronchial irritation, in which a cough occurs very early in connection with tubercles, are to be regarded as instances of bronchitis, the symptoms are very different from those of ordinary catarrh. It is not possible to discriminate between the influence of the slight bronchial inflammation and of tubercles in the production of the cough. We therefore class both these causes together, and regard the cough which occurs at the commencement of phthisis as the result of either or of both these causes; this is at first very insignificant, and sometimes, though rarely, quite absent. At first it is much more frequent early in the morning than at any other period of the day, although we may find a great irregularity in this respect; it gradually increases in severity, and in the frequency of its return, until at last it becomes severe and more or less paroxysmal. This occurs when cavities of some size have formed, and the liquid contained in them tends gradually to accumulate until

it gives rise to a violent paroxysm of cough. In the latter stages of the disease the patient is often disturbed in the night, but especially towards morning, by the intensity of coughing, and he then relieves himself of accumulations of liquid sputa which oppress his respiration, sometimes to a very great degree. After he has expectorated he again breathes with comparative ease for a time. In the last stages of the disease the cough becomes feeble and hollow, or cavernous in its character; a circumstance which is familiar to every one who has seen many cases of consumption.

The expectoration is of course nearly connected with the cough; at first it is, like the cough, very slight, and often insignificant, consisting of merely a little whitish or transparent mucus. After a time, it becomes more and more abundant, and of the usual bronchitic character, for there is either no purulent matter, or this is so small in quantity as not to attract notice. After the tubercles have begun to soften, pus is necessarily found in the sputa, and those are of a yellowish colour, differing often in appearance from ordinary muco-purulent sputa; for the softened tuberculous matter of which they are in great part composed is extremely viscid and different in appearance from pure pus. If the softening is very rapid the quantity of the thick pasty substance often amounts to ten or twelve ounces in twenty-four hours. In general it is combined with more or less thin mucus, which is intermixed with the thick yellow matter. As soon as cavities form, the thicker, more purulent part of the sputa, which is retained in them, is moulded into a rounded, irregular form, often with loose, cottony edges; these portions are suspended, if they contain air, or if not, they fall to the bottom of the transparent mucus. This constitutes the nummular sputa, which are not characteristic of phthisis in general, but only of one stage of it. If the walls of the cavities become hard, and cease entirely, or in great part to secrete purulent matter, the expectoration consists merely of a thin mucus, as the lining membrane does not in that case materially differ from that of the bronchial tubes. In the advanced stages of phthisis, and occasionally at a rather earlier period, when the strength of the patient is much enfeebled, the walls of the cavity may soften

down rapidly, and fall into a fœtid, thick, grayish liquid; this is nothing else than gangrene of a tissue partly filled with tuberculous matter.

The gradual obstruction of the lung with tuberculous matter, and its removal by softening, renders so large a portion of the vesicles unfitted for purposes of respiration, that the dyspnœa is always considerable in the advanced stages of phthisis. In the earlier period, however, this will often occur to a greater or less extent, so that dyspnœa is very far from being a mere mechanical result of the obstruction, but is in part caused by the vital action going on in the lungs. It is most severe in acute phthisis, and sometimes is one of its most prominent symptoms.

There is almost no pain from tubercles, properly so called; the uneasiness felt from time to time in the chest seems to depend entirely upon the accompanying inflammation. The local symptoms purely belonging to phthisis, with the exception of the cough and expectoration, are slight; but those belonging to the secondary inflammations are very numerous; even the cough and expectoration may be nearly absent, owing to causes which, in many cases, are not understood. We know, however, that the same causes which render other pectoral diseases latent, act here; that is, the feebleness of the patient, and the diseased condition of the brain. Hence in lunatics we find that phthisis is always obscure, and sometimes scarcely betrayed by any local symptoms. They gradually emaciate, seem unwilling to stir about, and have very little pain; but the cough is very slight, and even sometimes apparently absent altogether. So that in them, one of the most frequent signs of phthisis is the diarrhœa, which is less developed than in chronic dysentery, but is still quite severe, and together with the other symptoms will make the case evident.

Physical signs.—These are amongst the most decided in advanced cases, but very obscure in the early periods of the disorder. We do not now refer to the signs of the concomitant inflammations, but to those of phthisis, properly so called. At first these occur at the summit of the lungs almost always, and are limited to the signs of mere obstruction; the vesicular inspi-

ration is feeble, or harsh and slightly puerile, while the expiration is becoming louder and more prolonged. The character of the respiratory sound, therefore, gradually becomes rude, and at last approaches the bronchial respiration, in which it finally terminates as soon as the vesicular structure is completely replaced by the tuberculous matter. The bronchial respiration is more or less local, and is present chiefly at the summit of the lungs, both anteriorly and posteriorly, according to the quantity of tubercle, and the more or less obstruction of the larger bronchi themselves. It is, however, generally most perceptible at the posterior part of the chest, partly because the bronchial tubes are there larger than at the anterior part, and partly because the tubercles are most frequently deposited first at the back parts of the lung around the larger bronchial tubes. If the bronchial tubes remain uncompressed, the air of course passes freely through them, and the bronchial respiration may be tolerably loud; if, on the other hand, they are soon closed, the respiratory sounds are all feeble. Then the bronchial respiration may sometimes be not heard with any distinctness. As soon as softening begins a slight rhonchus is heard, approaching more nearly to the subcrepitant than any other: this gradually passes into decided crackling, and finally into gurgling, as the liquid becomes more abundant, and the cavity increases in size. The crackling is not always constant, however, neither is the gurgling. Both these sounds may disappear when the liquids in the cavity are removed by expectoration. If the patient remains, however, quiet for a time, without much cough, these signs may again be heard. The cavernous respiration and gurgling will both cease for awhile when the cavities are blocked up with a thick matter, but will again be developed as soon as the patient expectorates freely. The cavernous respiration is generally developed with the gurgling, and sometimes replaces or alternates with it.

The signs of percussion are of course limited in phthisis to those of induration of the parenchyma; they give us no information as to the progress or approach of softening. As the tubercles are generally most developed at the summit of the lungs, the dulness is early perceptible there; hence it may often be first detected by percussing above the clavicle, or upon, or immediately

beneath it; and however slight the dulness may be, there is little difficulty in distinguishing it, if attention be paid to the natural degree of resonance, and the two sides be carefully compared together. The intercurrent inflammation may, of course, give rise to varying degrees of dulness, which may rapidly increase or diminish.

We should also carefully auscult the voice in cases of suspected phthisis. If the resonance of the voice be extremely slight and limited to the summit of the right lung, it is a sign of very little importance unless conjoined with other indications of the disease. But if it exists in the left side, or if it be conjoined with bronchial respiration and dulness of percussion, it is a valuable indication of phthisis. When the tubercles exist to a greater degree, the resonance of the voice becomes more evident and passes into bronchophony. In cases in which the cavities are formed the resonance of the voice is gradually converted into pectoriloquy. The latter sign usually remains as a permanent symptom, but in some cases it becomes confused and less distinct; the loss of distinctness occurs when the resonance of the voice becomes amphoric, as it sometimes does in very old cases of consumption.

The signs of percussion and auscultation are the most important, but in the course of the disease attention should be paid to the conformation of the thorax. The parietes of course contract when pleuritic adhesions have taken place; even if there are no adhesions, the consolidation of the lung produces a partial contraction of the tissue, which causes a slight sinking of the ribs; the most sensible alteration of the conformation, however, is caused by the adhesions. This is most perceptible near the clavicles and behind them. The same causes render the ribs comparatively motionless in this situation, as the air enters imperfectly into the tissue which is hardened by the gradual deposit of tubercles.

It naturally occurs to every one that these signs are rather applicable to the advanced than to the early stages of the disorder; but there are generally some characters which afford a tolerably good indication of commencing phthisis as soon as a slight deposit has formed, or a partial infiltration of the tissue has taken place. These are not so much signs which are refer-

able to any of the regular classes which I described at the early period of this course, as mere trivial alterations of the natural respiratory sounds, which become important from their position and the coincidence with them of the general symptoms of common phthisis; without these, the signs are of some value, though a very limited one. Thus, the commencement of rude respiration, which is denoted by a trifling increase of expiratory sound, especially if it is heard in the left side, and a harsh, rough, inspiratory murmur, which differs from the natural vesicular sound, are both of some value—that is, if they are combined with a slight dulness on an extremely careful percussion; always, however, with the proviso that the general symptoms should be in some degree developed, for I cannot repeat too often that the general signs are at the commencement of the disease the most important. If the physical signs are met with in addition to them, a probable opinion may be converted into a certain one, which affords a good measure of the degree of the disorder; but if they are absent, the importance of the general signs is diminished, but not destroyed.

The physical signs of deposit and softening of tubercle extend gradually over the lungs, in proportion to the progress of the disorder, until a considerable portion of them may be involved. But the parts last affected do not offer as well-marked characters as those first attacked; hence the respiration in the parts which remain comparatively healthy, becomes in a great degree supplementary and puerile; and, even when tubercles have invaded them, the vesicles still dilate, and their peculiar murmur is loud and harsh, notwithstanding a certain number of them may have become impervious to the air.

3. *Symptoms dependant upon the accessary disease of the lungs and air passages, including larynx and trachea.*—To a great extent the remarks relative to these affections have been already anticipated, from their necessary connection with the subjects previously treated of. Thus, the secondary inflammation of the bronchi produces few symptoms differing from those of the tuberculous disease of the lungs: the bronchitis, however, may occasionally become acute, and thus the rapid increase of the cough and dyspnœa, and the formation of the characteristic rhonchi,

may establish the nature of the intercurrent affection. The sputa are often also increased in quantity, and become more transparent, like those of the earlier stages of ordinary bronchitis. Pneumonia too gives rise to increased dyspnœa, and to more or less crepitus and roughness of respiration, with frequently a viscid transparent expectoration; but the bronchial respiration is much less loud than in ordinary pneumonia, and the increase of dyspnœa is much less considerable than we might, *à priori*, suppose it to be. In other words the chronic disease modifies the symptoms of the acute affection. The secondary pleurisy is almost always of the dry kind. Effusion sometimes, however, takes place during more advanced stages of tuberculous disease, but this is rather an exception than a rule: the ordinary symptoms of the pleurisy are pains which vary from a mere stitch to a severe, sharp, lancinating pain, preventing the patient from lying on the affected side. The flying or wandering pains which are at times felt in the thorax during the course of phthisis are probably dependent upon the same pleuritic complication, although this is not perfectly certain.

The inflammation of the larynx and trachea has a much more important connection with phthisis. Chronic laryngitis is often called laryngeal phthisis, which is a sufficient proof that a close connection or a great similarity was supposed to exist between these diseases. When the affection of the larynx occurs late in phthisis, it is absolutely secondary, and results, in part at least, from the irritation of the sputa passing from the lungs over the larynx and trachea, and thus giving rise to inflammation and ulceration. The form of chronic laryngitis which attracts most attention, however, is that in which the lesion of the larynx precedes the disease of the lungs, and for a long time appears totally independent of it. But after a time, which is very variable as to length, the signs of consolidation of the lungs are apt to supervene, and the case may then terminate in decided phthisis. From our knowledge of this frequent connection, we must be cautious of the prognosis of such cases. It is true that if the laryngitis can be arrested at a tolerably early stage, the patient will probably not become consumptive; but should it resist our

efforts to cure, the disease almost always terminates in a tuberculous affection; this is the case both with the common and syphilitic varieties of acute laryngitis. Of course the existence of a highly-developed tuberculous diathesis greatly enhances the danger of the case, and, under these circumstances, the laryngitis is sometimes little else than the commencement of the morbid phenomena.

The same remarks apply to chronic trachitis, except that it is a more obscure affection, not connected with a special function like the larynx. The symptoms are generally merely cough, with an obscure sensation of tickling or soreness above and immediately below the upper margin of the sternum; while those of the laryngitis, in addition to the sensation of irritation, are hoarseness, gradually passing into aphonia. The trachitis is less important in itself than the laryngitis, unless there be some evidence of general tuberculous disorder, when it is quite as grave. Like the laryngitis, it should be removed as soon as possible.

The disease known by the name of chronic pharyngitis, or sometimes "clergyman's sore throat," is occasionally connected with phthisis. But the connection is rather an accidental than a fixed one, for the disorder consists essentially in an inflammation of the fauces, including the uvula and tonsils. It is certainly rather more apt to occur in individuals who offer the characters of the scrofulous diathesis than in others; and it has apparently some agency in favouring the development of phthisis in these individuals. It is often complicated with a chronic inflammation of the larger bronchial tubes.

4. *Symptoms of other organs than those of respiration.*—The symptoms of the diseases of other organs than those immediately connected with the lungs are very numerous in the different periods of pulmonary consumption. Indeed, every disease which produces so deep an impression on the whole economy must of necessity give rise to many functional disorders in the different stages of its progress; and, on the other hand, those local affections will often determine the development of phthisis by the operation of the general laws which we have already laid down as to the connection of tuberculous disease with the en-

feebled condition of the body, which is readily brought about by the action of a local affection.

When these local symptoms precede phthisis, they are not in most cases dependent upon the development of tubercle; when they occur during the course of the disease they are more frequently the direct symptoms of the growth and progress of this morbid body, but in the majority of instances this is not the case. The proper way of stating the subject is this:—1. In some cases of tuberculous disease the morbid product is developed in different organs of the body to a sufficient degree to cause its proper symptoms, while the proportion of the tuberculous matter in the lungs is still so much greater than in other viscera, that the specific designation, pulmonary consumption, is retained; in most of these cases the tubercles in the different viscera are developed at a later period than those of the lungs; in a few, the former precede the latter. 2. The accompanying disorders and symptoms of other organs than the lungs may have no immediate connection with the growth of tubercles. These symptoms are extremely numerous, and occur either previously to phthisis, or in its various stages.

The symptoms of tuberculous disorder of the organs of the body, other than the lungs, cannot be distinguished from those of ordinary chronic inflammation; indeed, the two affections are often united, and occur together. This is particularly the case in the serous membranes; that is, the pia mater, pleuræ, and peritoneum. The inflammation is in these cases of a slow subacute variety, and we recognise the tuberculous complication chiefly from its persistence and slow progress. In the intestines the symptoms of the tuberculous disease of the follicles are essentially intermittent at first, and they vary incessantly, diarrhœa often occurring for several days, and then being followed by constipation; after a certain time the diarrhœa may entirely cease, and the follicles, which are the seat of the tuberculous deposition, will cicatrize. There are no other cases of tuberculous deposit in mucous membranes in which we can recognise its symptoms.

In the serous membranes it is essentially connected with inflammation; and the symptoms are therefore inflammatory,

but of the subacute kind. All the varieties of these disorders are closely allied together, and constitute the tuberculous disease of serous membranes which may occur before any tubercles are formed in the lungs, but in the majority of cases they occur in adults during the progress of pulmonary phthisis. In other cases of tuberculous deposit than those just mentioned, the lesion is attended with symptoms of functional disorder of the organs attacked, in proportion as it produces a positive destruction of the tissue, or as it is accompanied with inflammatory action. We see, therefore, that the tuberculous deposit gives rise to few symptoms, except it is so situated as to disturb the function of an organ.

Of the tuberculous lesions of serous membranes the most interesting in children is tuberculous menengitis, a disease not formerly looked upon as connected with phthisis, but now known to be a simple variety of tuberculous disease. It is sometimes, but rarely, found in adults, and then it generally occurs in confirmed cases of phthisis; but in children they often show no signs of tuberculous disease until meningitis is developed.

The other lesions, and the attending symptoms which occur in phthisis, or sometimes even before tubercles are actually formed, are extremely numerous, and very various in character. They are sometimes prominent enough to attract attention almost exclusively to them, and they obscure the characters of the most important affection. Of this nature is dyspepsia, which is a very frequent though extremely irregular symptom. In some cases it occurs very early in the disorder, and may appear before there is either positive or probable evidence of tuberculous formation; but there are cases of dyspeptic phthisis, in which the disorder of the stomach appears often to be quite independent of either general or local tuberculous disease. In other cases the gastric disturbance is evident before the local disorder, and is clearly connected with the loss of appetite; it may give rise to phthisis in one of two ways,—either by the febrile excitement which it produces when the disease assumes an acute form, or by the alteration of the fluids which produces a peculiar action of the mucous membrane, and causes a slow softening and destruction of it. The complication of dyspepsia

and phthisis constitutes one of the worst forms of consumption; as long as the digestive functions are unimpaired the disease is slow in its progress, and attended with little suffering to the patient; but if the nutrition fails it becomes much more acute.

The intestinal canal is subject to many derangements; the natural effort of the disorder, like most febrile affections, is to produce constipation; but diarrhœa may occur not only from the formation of tubercles, which has been already mentioned, but from the usual causes of inflammation. In most cases, the symptoms do not differ from those of the same diseases when they occur in a less complicated form; but those of the pulmonary affection are singularly modified, the cough frequently subsides, and the disease is apparently much better. The inflammation of the bowels then acts like any other revulsive action. The cough is again increased as soon as the diarrhœa subsides.

Fistula in ano is another affection closely connected with the alimentary canal. Dr. Louis came to the conclusion that this was a rare complication in phthisis, but his conclusions are based upon peculiar data: on examining all the phthisical patients who entered the wards of a hospital, he found that fistula in ano was extremely rare. If he had examined, on the other hand, all cases of fistula in ano admitted into a surgical ward, he would have found that a large portion of them end in phthisis, either during the continuance of the fistula, or after it has been healed by a surgical operation. As a general rule, cases of consumption complicated with fistula are quite slow in their course, and they are most frequent in men who are advanced to the middle period of life. These cases of fistula ought very rarely to be treated by a surgical operation. I have often thought that I was rendering an important service to patients by preventing them from allowing industrious surgeons to tamper with cases of the kind mentioned.

The affections of the liver are frequent in phthisis, especially in women, particularly the young. The most frequent of them is the fatty degeneration of the liver, which is rare, except in

phthisis of women and in drunkards. Why these two conditions should both give rise to the same, or nearly the same alteration, is extremely difficult to explain. The functions of the liver are but moderately impaired, notwithstanding a large portion of its tissue is converted into fat. There is another disease of the liver which occasionally occurs in phthisis, or rather just before the tubercles are developed, which is more important than the fatty state. That is, cyrrhosis: this disorder is most frequent when phthisis occurs in countries where intermittents are endemic, and therefore it is often difficult to distinguish the precise time when tubercles are formed. The only mode is to attend carefully to the local indications of disease of the lungs, especially to the physical signs.

I am compelled to group together the secondary lesions of phthisis, and their symptoms, otherwise this subject would be extended to too great a length. Condensed as this view is, however, some of these secondary alterations must be omitted, for the very sufficient reason, that a disease of great duration, pervading the whole economy, and causing much febrile excitement, necessarily gives rise to nervous and irregular secondary lesions. Hence we often find that the phthisical patient complains of severe pains in the bones or muscles, which appear to have no necessary connection with the disease, but belong to the class of unexplained sympathies.

Diagnosis.—The diagnosis of phthisis is not attended with any difficulty in advanced, or even in early cases, provided they are regular, and the symptoms follow their usual order. But in cases in which the local signs are not well developed, or the symptoms connected with other organs predominate over those of the lungs, the subject is much more difficult; and we are then obliged to resort to two modes of diagnosis. One is to group together carefully the symptoms we observe, and then to compare with these groups different diseases which might possibly give rise to similar symptoms. Thus, any two or three of those symptoms which I have just described as belonging to the lungs, with the addition of emaciation and the febrile movement so frequent in commencing tubercles, would render it probable that the case was one of commencing phthisis. It is true that a

complete diagnosis cannot always be made until the disease has advanced far enough to betray some of its essential physical characters, but this is not the case in the majority of patients.

There are certain other signs which are of great value in the diagnosis of early phthisis. These are either individual symptoms, or peculiar groups of collective signs, which would singly be of little value. The most important of them is, perhaps, hemoptysis. This symptom receives different degrees of attention; some writers consider it almost pathognomonic of phthisis, while others attach comparatively little importance to it. There is, however, little difficulty in reconciling these conflicting opinions; and if we examine the facts relative to it under several points of view but little real difference of opinion remains. Hemoptysis, however, is not necessarily connected with tuberculous disease of the lungs. It may arise as a consequence of disease of the heart, in which the lungs become engorged with blood, and relieve themselves by hemorrhage, or it may arise in women as an effect of suppressed menstruation. Besides these cases, it sometimes, though rarely, happens that a flow of blood takes place from the lungs without any such obvious cause, and without an apparent connection with tubercles. The latter cases it must be supposed are quite rare, so that hemoptysis is still, in the large proportion of patients, a symptom of formed or commencing consumption. We may state in general terms, that at least two-thirds of all who have hemoptysis are actually affected with consumption, or are on the point of becoming so. But even when consumption follows an attack of hemoptysis, it is not the most fatal form of the disorder; a number of such cases occur in daily practice. Amongst them I would cite the case of a physician of Philadelphia, who had frequently repeated attacks of hemoptysis, with other symptoms of phthisis; from them he however recovered, and now enjoys good health, and is able to attend to the fatigues of an extensive practice.

Hemoptysis occurs in three different relations to phthisis: 1st, before tubercles are developed; 2d, when they are still crude, and perhaps few in number; 3d, when cavities are formed. In the first two cases, the blood is evidently secreted from the mucous membrane of the smaller tubes, and probably from the vesicular

structure; in the third, it comes in most cases from vessels which pass through the bands running across cavities: these may finally give way to ulceration before their caliber is completely obliterated, and a large, and even fatal, hemorrhage may suddenly occur.

Hemoptysis is of little value as a diagnostic character, unless abundant,—that is, exceeding a wine-glassful in twenty-four hours; a discharge of blood from the lungs in less quantities will, to a certain extent, indicate a tendency to tuberculous disease of these organs, but is not in itself of much importance. If the hemorrhage be more abundant, and occur without any obvious cause, it must always be regarded as a sign of commencing phthisis, or at least of a peculiar condition of the lung itself, or of its capillaries, which often ends in tuberculous formation. The evidence in favour of this conclusion is extremely strong, and is not refuted by the fact that a number of patients affected with hemorrhage recover; for the first stages of phthisis are by no means incurable; and the varieties in which hemoptysis occurs are amongst the most favourable. These cases of exemption from phthisis after abundant hemoptysis are not extremely numerous, as any one may ascertain for himself by simply interrogating individuals who have arrived at the middle periods of life, and enjoy good health: of these a very small proportion have ever had hemoptysis; and this is true not only with reference to healthy individuals, but as compared with the whole number of phthisical patients; amongst the latter the proportion of cases of hemorrhage is very large.

The occurrence of tuberculous pleurisy, or even the long continuance or frequent repetition of the simple disease, is another indication of phthisis which will strengthen the more direct symptoms of the disorder. But we must not imagine that any single symptom is ever sufficient for the diagnosis of a disorder, which at its commencement is necessarily complex. Nothing but the grouping together of a number of signs, together with the indirect evidences afforded by exclusion, will afford the basis of a positive diagnosis.

In abnormal cases tolerably developed, however, there is no difficulty in arriving at a positive diagnosis. The general signs

of the disease become more developed, and on examining the chest we will always find dulness at the summit of one or both lungs, and various alterations of the voice and respiration at the same place; such as bronchial or cavernous respiration, crackling, and finally, resonance of the voice.

Prognosis.—The prognosis of phthisis is unfortunately quite clear in the large majority of cases; and when the disease is established it is regarded as almost necessarily fatal. This prognosis must, however, be taken with some reservation, as the disease is in its nature essentially different in different stages, and cannot be said to be unavoidably fatal except when the disorganization of the lungs is much advanced, and the tuberculous degeneration of the whole economy is carried to a very high degree. In the earlier stages the disorder may terminate in recovery; and there is no doubt that it not unfrequently gets well, even when the local sign of the disorder, the deposit of tubercles themselves, is actually formed. But these are not the most frequent cases; for before any actual deposit of tubercle can take place, a very extensive alteration of the whole fluids has in all probability occurred, and the deterioration will be found to have reached that point which renders recovery rare, but not impracticable.

Although in many cases of phthisis the possibility of recovery is now generally admitted, this result is by no means probable, except when a number of favourable circumstances concur; for as the causes of phthisis are for the most part very slow, but at the same time very powerful in their action, the disease cannot in many instances be materially influenced by remedies. It is therefore unfortunately true, that even when we foresee that the disease is approaching, or distinguish the first steps of the tuberculous formation, it cannot always be arrested,—but there are other cases in which the result is happily much more favourable. In order to distinguish these cases, we must bear in mind the circumstances already mentioned as complicating the progress of phthisis, or influencing its development. Of these the most important are a strong predisposition to phthisis, whether hereditary or acquired, and an exposure to circumstances known to favour the development of the disease. Individuals who present

this constitutional tendency are those who offer the well-known signs of the scrofulous constitution denoted by the peculiar colour of the skin, and have generally the very dark or the light rosy complexion; when the disease is hereditary, the dark complexion is perhaps more frequent than the light, and the skin has then a dusky, earthy tint, or a dirty aspect, which is often almost peculiar to this disease. It is not always the case that those persons are thin and feeble,—some of them are stout and muscular, but feebleness of body increases the tendency to the tuberculous development, and we may make the same remark with still greater force of the fat, pale, tallow-like complexion of some individuals, especially women, who possess an hereditary tendency to phthisis; the latter class of patients generally offer an enlarged, fatty state of the liver, and the prognosis in this case becomes very unfavourable.

If exposure to the causes favouring tuberculous development cannot be prevented, the influence of them must be obvious enough, and will greatly increase the probability of an unfavourable issue. In all cases, therefore, in which any direct evidence of tuberculous deposit is conjoined with hereditary tendency, or other strongly disposing causes, the disease is most intractable; this accounts in a great measure for the more frequently fatal termination of phthisis in the crowded and impure wards of a hospital. If there be no local signs whatever, but merely that constitutional deterioration which, unless arrested, is sure to end in phthisis, our prognosis is different; these indeed are scarcely to be considered as true cases of consumption; they are so only in embryo, and may be often arrested by change of residence, or other means.

The mode of development, and the early symptoms of phthisis, have also a considerable influence upon its termination. Some cases are unfavourable from the beginning, not merely from the strongly marked general symptoms, but because the local signs are known by experience to coincide with intractable forms of the disorder. The signs which may be regarded as impressing a favourable character upon the disease are hemoptysis, if occuring from time to time after exertion, and very moderate and local inflammation of the lungs before tuberculous matter is de-

posited in any large quantity. Hemoptysis, if extremely abundant, is not favourable, unless the patient should get perfectly well without irritative fever or further symptoms of tubercles; it then seems to relieve the lungs, and the disease is in general milder, and not unfrequently abates at an early period. But there is another form of hemoptysis which often occurs long before the disease seems to be concentrated upon the lungs, and is perhaps rather referable to a peculiar condition of the whole capillary system than to any local mischief: this renders the prognosis much less favourable; it is the spitting of blood, which often continues for years, a mouthful or two at a time after coughing or very slight efforts, and is hardly noticed by the patient. It is most frequent in young women, and in those who offer a strong constitutional tendency to phthisis.

The local inflammation of the serous membranes, or of the serous tissue of the lungs, is a favourable sign, because the action which gives rise to the disease is here a positive, tangible one; and if we succeed in changing it, or modifying its progress before tubercles are formed, the disorder may be arrested much more easily than in the more constitutional cases. If the tuberculous matter be actually formed, but limited to small portions of the lung, the prognosis may still remain favourable to a certain extent,—that is, the disease will be slow, and in a few cases will terminate happily, notwithstanding a cavity is formed.

The least favourable local signs are those observed when the disease begins in a slow insidious manner, by the trachea or larynx, which does not always call attention to the lungs, and the tuberculous degeneration proceeds in an unsuspected form: Not that chronic laryngitis is of itself necessarily fatal, but it certainly promotes the formation of tubercles; and when this point is once reached the disease generally assumes a severe and unmanageable character. In these cases, too, the tubercles are often scattered widely through the lungs, and of course are productive of more mischief than if they are limited to a small space at the summit.

The prognosis of phthisis must be taken in a more extended sense than that of its ultimate termination: we have to decide in

many cases whether the disease is to terminate speedily or slowly, in death or recovery; this investigation leads us to the study of the varieties of phthisis in relation to its character.

Duration of Phthisis.—Although consumption of the lungs is, in the large majority of cases, a chronic disease, it is from time to time met with in an acute form; that is, it may prove fatal in a period of less than three months. This depends upon the rapid formation of gray granulations, or tuberculous infiltration in a large portion of the lungs. The disease is then attended with much fever, and the general tuberculous signs, as already mentioned, are extremely developed. In many instances death does not take place so much from the pulmonary disorder as from the coincident inflammations, or tuberculous deposition in other organs, especially in the serous membranes of the brain. But phthisis may become acute when it begins in the ordinary chronic form, and the change is then rendered apparent by the rapid increase and severe character of the fever and sweats. Hence, although we know that the usual course of ordinary phthisis is slow, it is always possible that the type may change, and the termination may be hurried much more rapidly than usual.

Our prognosis in acute cases is directly dependent upon the diagnosis; for if we once recognise the disease as of the acute form, we can confidently state that its course will be probably a short and a fatal one. The duration of the ordinary variety of phthisis has been estimated by Dr. Louis to be about eighteen months; this is, perhaps, sufficiently near the truth,—but a large proportion of cases in hospital practice terminate in less than that period; in private practice the course of the disease is delayed so much by treatment, that the average duration of all cases, except the acute, is probably two years. The duration of consumption is greatly influenced by age; the disease is often acute in the young—rarely so in those more advanced in life; in the latter class of patients the disease is much more slow than it is in the young. The female sex has a similar influence with childhood, so that the most frequent cases of acute phthisis are to be met with in young girls, a little after the age of puberty.

Treatment.—The treatment of phthisis is by many regarded

as never curative, but merely as a means of palliating the most severe or harassing symptoms of the disorder. If we apply the term consumption only to those cases in which the disease is far advanced, and the constitutional deterioration is extreme, it is very plain that no means of cure exist, and that even palliation is in many cases difficult; but if we speak of consumption as of other diseases which tend to a fatal termination only after having passed through their early and more curable stages, it is strictly curable, and like these disorders must be treated in different ways, according to the mode of its development; for as tubercles are attended with very different symptoms, and originate in various modes, it is very clear that the most opposite methods of treatment may prove efficacious in combating the affection in its forming stage. But after the tuberculous deposit has fairly commenced, it obeys its own laws of growth and presents the secondary symptoms, such as hectic fever, emaciation, &c., which are peculiar to itself, and then one uniform method of treatment is desirable, or at least seems indicated. Besides, although the modes of development of tuberculous disease are very numerous, there is a form in which the symptoms are regular and uniform; and even in those varieties in which the modes of origin are most unlike, there is a peculiar character impressed upon the various symptoms, which is dependent upon the scrofulous or tuberculous diathesis.

This treatment would be specific for the disease, and might be curative if it could cause with certainty the absorption of the secreted product, and favour the cicatrization of cavities, when the loss of substance was not extremely great. If we possess such a mode of treatment we might then with great confidence expect to cure phthisis in nearly every stage. But as no real specific exists, we are obliged to content ourselves with the administration of alteratives, which have but a limited influence on the growth of tubercles, and of such remedies as act either upon the causes of the disease, or on the accidental disorders which favour the tuberculous deposit in an indirect way.

The alteratives used in phthisis are, for the most part, such as exercise a tonic and invigorating influence, at the same time that they produce their proper effect as alteratives. Mercury

is always injurious as a direct remedy in phthisis; it can never be of service except in those cases in which there is decided inflammation, and the tubercles result directly from it; but even in this class of cases the influence of the remedy is certainly injurious so far as it exerts an influence upon the proper tuberculous disorder, and it must be discontinued as soon as the inflammatory symptoms are removed. The effect of mercury in phthisis is now so well known that it has almost become an axiom in medicine to avoid it in the treatment of this disease.

Iodine was until lately more used than any other alterative; and if employed with discretion it scarcely ever does harm. I have found it beneficial at the commencement of cases in which the fever was but moderate, and the local inflammation but slight, especially when a circumscribed chronic bronchitis has preceded for a long time the actual development of tubercles. Hence it is well suited to those cases which are preceded by chronic inflammation of the trachea and larger tubes, and pass slowly into phthisis; and to the cases which are most closely connected with external scrofula. The patient is then often robust in appearance, and the local disease is slow in forming. Iodine is also useful in the purely constitutional cases, provided it be given cautiously, and the emaciation of the patient has not advanced very far; it should then be combined with vegetable tonics. The preparation to which, from habit, I was at one time accustomed to resort is Lugol's solution, prepared of the strength directed in the United States Pharmacopœia,—that is, one scruple of iodine, and two of hydriodate of potassa, to seven drachms of water. Of this I give to an adult from three to six drops two or three times daily; I very seldom exceed six drops three times daily, and often give much less. For the good effects of the medicine may be obtained much more certainly in this way than by giving it in larger but more irritating doses. I have never witnessed any other mischievous effects from the iodine than the disorder of the digestive canal, and a fulness of the head which sometimes results from it; but it is very certain that in some rare cases it acts as other powerful alteratives occasionally do, and it may enfeeble or disturb the functions of the whole body, with-

out removing the morbid action. Hence it is advisable to discontinue its use from time to time, and resort to mild purgatives for a few days, or to abstain totally from all medicine until the tone of the stomach is restored; it then is scarcely possible that an injurious result should follow. As the action of iodine is slow, we cannot observe any immediate impression produced by it; but when it is acting well, the complexion and strength of the patient improve, and the cough at the same time gradually diminishes. The latter effects may be promoted by appropriate expectorants, which should be given at the same time with the iodine. The appetite and strength almost always increase; and if these fail, or become less, instead of increasing, it is almost a sure indication that the medicine is not acting well. It is often useful to administer laxatives from time to time, even if the medicine be not suspended. As iodine evidently acts merely as an alterative, it is beneficial in that condition of the economy which precedes the secretion of tubercles, as well as in their more advanced stages; and it may be conjoined with other alteratives, such as the compound decoction of sarsaparilla, or with mild tonics. Without attributing to iodine any specific virtue, I am quite convinced that its powers are very great in commencing phthisis, and that it sometimes effectually arrests the progress of the disorder. The remedy seems to me to be least adapted to those cases in which tuberculization is very rapid, or the inflammation of the serous membranes very acute; that is, precisely to the worst cases of the disease.

The hydriodate of potass is on the whole preferable to the solution of iodine; that is, it acts with less irritation to the alimentary canal, and may be given with safety in many cases of the disease. The dose is five grains three times a-day, gradually increased to ten grains: the remedy should not, however, be continued long without intermission; it should be discontinued, and after a week may be resumed. There are some patients, however, who cannot take iodine in any form without great irritation; and at Geneva, in Switzerland, it was stated to me by several medical gentlemen of very high authority, that the remedy cannot be given except in very small doses—that is, doses of five grains produced very violent symptoms. This remedy, however,

is very far from producing at other places similarly injurious effects: as a rule, it would seem, that from some unknown circumstances, it in that situation loses its remedial power and acquires most mischievous properties.

When phthisis has fairly commenced, iodine, or any other alterative, is designed to favour the absorption of a product which is actually deposited. But there are many cases in which we know that a tuberculous action is going on; that is, that the process which ends in tuberculous secretion is actually at work, but as yet there are no tubercles. It is then important to arrest the formative action, and iodine is often of benefit in these cases. It is true that direct proof of this is extremely difficult, because it is not easy to prove that a disease which is slow and obscure in its mode of formation is really influenced or not by any remedy. The reasoning must be probable, and not demonstrative; and the truth is approached more or less nearly as the observer possesses the proper abilities for drawing conclusions of this kind. In these forming cases of tuberculous disease, iodine seems to act like alteratives of a hygienic character, and is certainly useful if no directly injurious consequences result from it; but it must be given in small doses, and from time to time should be intermitted. If these cases be very acute, the remedy must be omitted; for as a general rule it is quite unsuited to either the forming or the formed cases of acute phthisis or any other inflammatory form of tuberculous disorder. In these acute cases the inflammatory element predominates, and the action of the remedy is too stimulating, as it is in cases of phthisis which begin by local inflammation. With these reservations as to its use, I have found that iodine is one of the most efficient remedies in early and in forming phthisis. How far its usefulness extends is not a subject upon which we can speak with entire confidence.

Within a few years past a new remedy has been introduced to the profession in the treatment of pulmonary consumption, and within a year or two past the use has astonishingly increased. It is the cod liver oil. This oil, which is obtained from the liver of the cod fish, is brought to market in three principal varieties; the best and most tasteless is nearly or perfectly transparent,

with but a slight odour or taste, and is almost always taken by patients without difficulty; this is said to be obtained from the liver of the cod very soon after the fish is taken, and before the least alteration has taken place in the oil. Another variety is of a dark reddish tint, of more decided taste and smell, and is obtained from the liver of the cod a day or two after it is caught; the colour and taste are probably owing to a slight decomposition which has taken place in the liver before the oil is extracted. This variety is by no means so easily borne by the stomach as the paler kind; indeed, I have found that many patients could not take it without manifest suffering, who tolerated the first-mentioned variety without the slightest difficulty, but were nauseated and oppressed as soon as they attempted to take the highly coloured oil. The third variety is of a still darker hue, and is probably obtained only from the liver of the fish after decomposition has fairly commenced; this oil is not used at Philadelphia except by tanners in dressing hides.

The chemical composition of the cod liver is known; and it contains, besides the usual constituents of oily matter, a small proportion of iodine,—too small, however, to induce us to suppose that any portion of its powers depend upon it. Unfortunately, chemists are not able to suggest any positive test for its purity; and there is great reason to believe that the quantity of the oil in the market will not diminish, notwithstanding the number of cod caught may not increase; and its comparatively high price offers a strong temptation to many unprincipled venders. Still, there is reason to believe that the greater part of that now offered for sale is pure,—at least all that comes from sources of undoubted reputation. Other animal oils have not been tried sufficiently to ascertain whether they are similar in their effects to that of the cod liver. It is said, however, that they are not so; but I must confess that it seems to me very probable that they will not be found to differ very materially; this is a subject however, on which I am about to institute a series of comparative trials.

The dose of the cod liver oil is a table-spoonful three times a-day, taken in a little of the froth of beer or porter; any other liquid not possessing any positively medicinal properties may,

however, be used in place of the froth of malt liquors. A very good, and perhaps a better mode of taking the oil, is to chew a small piece of orange peel, then to swallow the oil either pure or floating in some aromatic infusion, or a little rose or orange-flower water, and afterwards again to chew a fragment of the orange peel. In this way there is no disagreeable taste perceived. Many patients are not able to take the oil as often as three times a-day without repugnance; it may, however, often be given to them twice a-day without difficulty. In these cases it should be given about eleven or twelve o'clock in the morning, and again in the evening. When the patient takes the usual dose three times a-day, I have been accustomed to allow the patient to take it at such times as are least diagreeable to him. It is often, indeed generally, best to begin with a less dose than a table-spoonful; a dessert-spoonful twice a-day is often enough at first; but as soon as the patient becomes a little accustomed to the remedy it should be increased to the usual dose. It is very rarely, if ever, necessary to give the oil in larger doses than a table-spoonful; some patients, however, prefer taking a larger quantity. In those cases I should not object to the dose being a little increased; but if the oil be given in very large doses it is apt to produce purging, and of course cannot be absorbed in sufficient quantities to produce its peculiar effects of increasing the amount of fatty substance of the body.

Some consumptive patients are not able to take the cod liver oil; in some it produces much nausea and an insufferable disgust, which prevent the patients from taking it all. At other times they can bear it with great difficulty, especially if the darker-coloured oils be used: in these cases they may sometimes still take about two dessert-spoonfuls a-day, but they cannot take the oil in sufficient quantity to offer a reasonable hope of decided improvement. The disgust which patients not unfrequently feel towards the oil will, however, not always continue; by attending to the time at which it is taken, and occasionally changing the vehicle in which it is administered, they sometimes acquire a power of retaining the medicine, which at first would scarcely be expected. When I prescribe it, therefore, I am always very unwilling to believe that a decided disgust can prevent its exhibi-

tion, and I only give it up when I become convinced that the stomach of the patient can no longer tolerate it. Diarrhœa, when the intestines are much ulcerated, sometimes prevents the persistence in the use of cod liver oil. As a general rule, unless I can check the diarrhœa by the addition of a few drops of laudanum, I regard this symptom as contraindicating the oil whenever it is increased by it. In the majority of cases of phthisis, however, diarrhœa is not a constant symptom until the very last stage of the disease, when cod liver oil or any other medicine can do but little good.

When cod liver oil does good the patients increase in flesh, and lose, to a certain degree, the characteristic physiognomy of phthisis. The pain and cough also diminish—sometimes are scarcely to be perceived at all—while the physical signs of the disease are also sometimes lessened, although generally not in proportion to the decline in the general symptoms. But in one patient who entered the Pennsylvania Hospital last autumn under my charge there were decided crackling, imperfect cavernous respiration, and flat percussion at the summit of one of the lungs, together with fever, cough, and emaciation. He was put under the use of the oil; at first the only kind tried was the dark coloured; this, however, produced much nausea and could not be taken regularly; the white oil was afterwards given: the remedy was afterwards continued by Dr. Wood during his term of duty. In March, 1850, about six months after he had commenced the treatment, he had become much fatter, so as to present the aspect of a person in at least the average condition of health; the pain had subsided; the cough was nearly gone; and the physical signs much improved. That is, there remained only a very faint blowing sound of the respiration at the summit of the lungs, with a little dulness of percussion. Like all patients who have used the oil for a long time, his whole skin had assumed a dirty, greasy hue, showing the entire absorption of the oil, and its transmission to the exterior of the body, much in the same way as sulphur taken internally seems to permeate the whole tissues. This case, however, was the only one of those treated during my term of service, or that of Dr. Wood, in which the amelioration was so decided as to merit the

title of cure. In a number of patients, however, we found that there was a decided improvement; sometimes they gained flesh decidedly, and the cough much diminished. These marks of improvement although real are not, however, permanent; the cough and fever commenced again and the patient rapidly emaciated, while the remedy was not borne perhaps as well as it had been at an earlier period. In a majority of cases in which the patients were evidently affected with pulmonary phthisis, benefit certainly does result from the cod liver oil; but in how large a proportion there is a decided and real improvement in the symptoms cannot now be pointed out with certainty. In a few cases we may expect a cure.

I am, however, by no means sure that the cod liver oil is destined to be looked upon as the remedy adapted to most or nearly all the cases of pulmonary phthisis. It will certainly, however, be regarded as a valuable remedy, and one that cannot easily be exchanged for any other, until some one possessed of better, or at least as good qualities, can be discovered. Like all new remedies, however, it has received at least as full a share of attention as its certain results have yet warranted; and perhaps after physicians at large discover that it is not, in the large majority of cases, an actual cure of phthisis, they may be tempted to throw it aside without giving to it the value which it really deserves. Patients themselves, however, are now almost always willing to aid the physician in an attempt to stay the progress of so fearful a disease, and we have, therefore, rarely any difficulty in giving it to those whose stomachs are not too irritable to support it; and in many cases they are anxious to resort to the remedy as a last resource when no hope longer can be entertained of even a partial improvement.

It is very probable that the cod liver oil will be found to be most serviceable in cases in which there is a strong hereditary tendency to consumption, although the disease is not yet fairly developed. In these cases there is often much emaciation for a long time before cough or fever appears. The patients generally have a good, sometimes almost a voracious appetite, but still they do not at all gain flesh, on the contrary they remain excessively thin. In these cases, it has seemed to me, the cod liver

oil may be taken in small doses for a long time, to develop a greater degree of embonpoint, and remove the extreme leanness which is often a sign of commencing phthisis. Such patients may take the oil in doses of a dessert-spoonful twice a-day for many months.

In other cases the disease begins slowly, the patient loses flesh, coughs, and there is a slight alteration of the sonorousness and of the respiration at the summit of one of the lungs. In these cases, too, we may expect decided advantages from the oil, which should then be given in the usual dose, and all proper directions as to air and exercise should be conjoined with its use. We may in these cases, I believe, sometimes succeed in eradicating the tuberculous disease; a result which is scarcely to be looked for when there are cavities and a larger deposition of tubercles in the lungs.

But there is a question which is a very important one: Does cod liver oil ever cure pulmonary consumption when it is decidedly advanced, and cavities exist in the lungs? For my part, I must confess, that I have never yet met with a case in which the physical signs, as well as the general symptoms, have entirely disappeared. Indeed, in most cases of the disease we do not find that the physical signs diminish as decidedly as the general symptoms. Sometimes the cavernous respiration and the flat percussion actually increase while the patient is gaining flesh, and his fever is considerably lessened. In these cases, however, the tuberculous deposition goes on, but the patient becomes less sensible to its effects in the general system, and therefore no longer emaciates, or even actually gains flesh, while the tuberculous deposition continues. We are therefore obliged to conclude that cod liver oil is not properly a specific against phthisis, and does not usually prevent the tuberculous deposit; it simply increases flesh notwithstanding the disease; and sometimes may indirectly bring about a permanent cure in cases in which the tuberculous tendency has been ameliorated, and is therefore readily removed. The ordinary articles of food it has been long known should be nutritious in cases of commencing phthisis, and if we add to food which often cannot be readily taken, or at least digested by the patient, a substance which has the power of pro-

moting the fatty development, and thus antagonizing the prominent symptoms of the disease, we do a great deal, and leave the patient in the best possible condition for recovery. My own impression however is, that cod liver oil will be more certainly useful in those cases in which patients are evidently disposed to consumption, and have inherited a strong tendency to it, although it is not yet developed. I would recommend the use of the remedy in these cases, especially when the patient is already thin or slightly emaciated; and I would direct it to be taken as an article of food rather than of medicine for a long time. When the patient is either positively averse to the remedy, or becomes tired of it, he might try other animal fats or low vegetable oils, in the hope of producing similar benefit. For, as I have already intimated, I strongly suspect that the cod liver oil is better than other animal fats, simply because it is more easily digested and thus absorbed into the system. We, therefore, see that it is a matter of no little importance to procure oil which is free from disagreeable smell or taste. At first when I prescribed the oil there was none of the pale coloured in the hospital, as it happened at that time to be exceedingly scarce in this city. But few patients would take the darker oil without suffering more or less uneasiness at the stomach, which often prevented its continual use: the light coloured oil was almost always perfectly well tolerated, and sometimes patients seemed almost to acquire a fondness for it.

The following statement is one for which I am indebted to Dr. Levick, one of the resident physicians of the Pennsylvania Hospital. It gives the results obtained in that institution for the space of six months, in which the medical wards were under the care of Drs. Wood, Pepper, and myself, attending physicians to the hospital.

The following may be given as the results of the use of cod liver oil in the medical ward of Pennsylvania Hospital during the last six months:

1st. *Of the oil.*—That the light coloured oil can be taken without difficulty by patients whose stomachs have steadily rejected the brown oil.

2d. *Of the mode of administration.*—That a few of the patients

have taken the oil without any adjunct to disguise its taste. That its nauseating properties are corrected by its administration with milk; but that its taste is most effectually disguised by the froth of porter.

3d. *Of the time of its administration.*—That as a general rule it has been taken *before* meals, but that in four instances where it was not tolerated before meals it was readily taken after meals.

4th. *Of diarrhœa as a contraindication to its use.*—That the existence of diarrhœa is not a positive contraindication to its use. In three instances in which patients were thus affected, no increase of the symptoms was produced by its use, and no diminution by its abandonment. In a fourth instance when the diarrhœa had previously existed, the discharge appeared to be increased by the exhibition of the oil, and abated with its withdrawal.

5th. *Of its effects in cases of phthisis pulmonalis.*—That patients using the oil have increased in flesh, in weight, and strength. That while using the oil, their cough and expectoration have diminished; that with some, hectic and rigors have entirely disappeared.

That six of them have been so much benefited as to leave the hospital and resume their former occupations. That in one instance, a patient who entered the hospital with cough, copious purulent expectoration, extreme emaciation, inability to leave his bed, and with the physical signs of a cavity under left clavicle, after six months use of the oil left the hospital weighing 140 lbs., with little or no cough, no hectic or rigors, and with an almost entire absence of expectoration: the physical signs having greatly diminished.

6th. *Of the physical signs.*—That the improvement of the physical signs is not coincident with that of the general symptoms.

7th. *Of its use in general scrofula.*—That in scrofulous diseases where there was no reason to suspect the existence of pulmonary tubercles, the improvement of the patient's health has been very decided.

8th. *Of congestion of lungs as produced by cod liver oil.*—That there has been no decided evidence of such a result following the use of the oil in the preceding cases. [Two patients of the twenty while using the oil had severe attacks of hemoptysis, but there was no reason to refer them to the use of the remedy.]

9th. That in those cases which have terminated fatally, the appetite, the nutrition, and strength of the patient appeared for a time to be decidedly increased; that the life of the patient appeared to be in this manner temporarily protracted; but that for a few weeks immediately preceding death the remedy seemed to have entirely lost its value.

10th. *Length of time*, &c.—That to be of any decided permanent benefit its use must be steadily persisted in. It should be continued even after the most striking symptoms of the disease have in a great measure disappeared.

In advanced cases of phthisis hectic supervenes; and all alteratives are useless, unless they act merely as tonics. Indeed, iodine has generally appeared to me to be of positive injury as soon as softening had taken place. For even if its influence upon those portions of the lungs in which the disease has not advanced very far is good, it acts injuriously upon the surface of cavities and the softened tubercles.

In the early stages of tuberculous disease of the lungs, hygienic alteratives have always claimed the first place; indeed, you may readily believe that no medicinal alterative can well be useful if the hygienic measures which are best adapted for the disease be neglected. These are very well understood; and, besides the choice of proper localities for a residence, and for a journey or sea-voyage, consist mainly in adopting such precautions, and in pursuing such a course of life, as are least fitted to develop the disease.

The alterative effects of a long journey and of change of residence are well known in phthisis. They both act nearly in the same way: a journey in the pleasant season of the year, or in a climate which renders all seasons agreeable, is often of great benefit in forming phthisis, or in those varieties of the disease in which there is not much febrile excitement or local inflammation; if these exist, the journey is irritating instead of invigorating. If the strength of the patient be good, the journey should be made on horseback, or in an open carriage, and be pursued as long as the strength of the patient continues to improve. A sea-voyage is sometimes preferred to a land journey; as a general rule, however, it is less useful; there are, however, cases in

which the strength of the patient is not great, but the disease at the same time is slightly advanced, and the fever moderate, in which a sea-voyage in a mild latitude is of great benefit. It is also of great benefit in those cases in which the phthisis is attended with slight but frequent hemoptysis during its early stages. A short voyage is of little comparative benefit; it should be long enough to act as a decided alterative; hence, one to the East Indies, or to the Mediterranean, or South America, answers best. The shorter voyages to Madeira, or the West Indies, are only advisable, because they are necessary to a winter's residence in these climates.

The question of a change of residence is always of great interest to a phthisical patient; in fact, there is no one upon which he is more disposed to consult his medical adviser. The general anxiety felt by patients to resort to this mode of relief is a conclusive proof that there is something in it, for it still continues although the lapse of years shows that the advantages of such a residence are much overrated. These advantages may be stated very briefly; by a winter's residence in a warm, but equable climate, the tendency to slight congestions or inflammations of various portions of the organs of respiration is obviated, and a cause of irritation is then removed. Secondly, the mildness of the climate allows the invalid to enjoy the advantages of fresh air and exercise without much discomfort or risk. Lastly, the change of climate and of air is of itself of great benefit as an alterative. These advantages are, however, limited; they are not specific in the treatment of consumption; hence many cases are not at all relieved, some are even aggravated. If the disease be of the acute form, and especially if it be attended with much fever, the patient is almost always rendered more feverish by the journey, and the affection tends to advance more rapidly; or if the disorder be so much advanced that the strength of the patient is rapidly declining no advantage can be expected. It is in the milder and more chronic cases that the change of air does good, especially if the patient has found by experience that the winter is of injury to the organs of respiration, and gives rise to much cough or other signs of laryngeal or tracheal irritation. Of this class of patients very few individuals will be

found to die abroad; most of them return with some relief of their symptoms, especially for the first winter; if the disease be not arrested, however, the benefit of a second winter is very doubtful. When the disorder of the digestive organs is a prominent symptom, the benefit from the voyage is very considerable, but the effects of a protracted residence in a warm climate are very doubtful.

The advantages resulting from a change of climate are not, therefore, such as to induce us to advise patients to leave their homes, and subject themselves to many privations without due consideration; and we should steadily oppose it, if the reasons for the voyage are not strong.

It is difficult to point out the precise spot which is most suitable for the winter residence of a consumptive patient. Many physicians differ with perfect good faith as to the relative advantages of the different places which they recommend. The Island of Cuba, Santa Cruz, the West India Islands in general, and Florida, are most in fashion with invalids from the United States. Madeira is much resorted to by those from England, and, to some extent, by Americans; and various parts of the South of France, of Italy, and the shores of the Mediterranean generally, are preferred by the continental nations. A full account of the various advantages of many different situations will be found in the work of Sir James Clark, in which the subject is treated at length. My own advice is regulated very much by the peculiar circumstances of the patient, his willingness or his desire to undertake a distant sea-voyage, and his pecuniary means. All of the different localities have some advantages, and require a careful examination before directing positively as to their choice. But it is not expedient to recommend any one situation to the exclusion of others,—still less is it expedient to advise a change of residence, even for a season, or a change of occupation, except upon strong grounds, and in cases where no harm at least will ensue.

The treatment specially intended to prevent the growth of tubercles being very limited in its action, we are obliged to resort to collateral measures, which act rather upon the intercurrent diseases which favour the development of tubercle, than

upon this product itself. These intercurrent diseases are for the most part of an inflammatory character, and, as already mentioned, precede or accompany the tuberculous deposit. Those which precede it do not require any special treatment; but we must watch their termination, for the greatest danger is to be feared just at their close. Hence, in long protracted inflammations of the larynx, trachea, or bronchial tubes, and in severe or repeated attacks of pleurisy, the treatment should be continued until the disease entirely disappears, and the restoration of the patient to his former health is complete.

The intercurrent inflammations of the chest are more difficult to combat, because the tuberculous matter is actually developed, and the directly antiphlogistic treatment must be less continued. Of these inflammations the most common is that of the bronchial or tracheal mucous membranes; most of the tickling and cough depends upon this, and a large portion of the sputa comes from the same source; hence, the patient is solicitous to quiet the irritation, and the physician is constantly tempted to resort to opiates and other palliatives. It is often necessary to give opiates; that is, if the patient be unable to sleep, the cough must be allayed; and if the tickling and irritation be incessant during the day it is necessary to quiet them. Still opiates are essentially disadvantageous, and in most cases they should only be resorted to if other means fail, and then in small doses, so as to preserve the stomach in as healthy a condition as possible. Hyosciamus is preferable with many patients to opium; that is, if it tranquilize the cough—for it will not do so always; a mixture may be made of an ounce of the syrup of Tolu, the same quantity of the syrup of senega, and six grains of hyosciamus, with four ounces of gum arabic mucilage. Half an ounce of wine of ipecacuanha may be advantageously substituted for the syrup of senega in many cases, especially if there be much fever. This quantity may be taken in the course of three days, a tablespoonful at a time. In this dose it is well to watch the effects of the hyosciamus, for at the end of one or two weeks it will occasionally produce some symptoms of narcotism. The opiates most used are the salts of morphia and the elixir of paregoric; on the whole, the former are preferable, but the quantity should not

exceed a quarter or a third of a grain in the twenty-four hours: with many patients it is best to give a small quantity of morphia at night, without any other substance, but in most instances the cough is soothed by a combination of a mucilaginous vehicle and of an expectorant. As expectorants, we may use the syrups of senega or ipecacuanha, and very rarely antimony; the latter is best fitted for those cases in which there is much fever, and in some instances no inconvenience follows,—in others the stomach rejects all remedies of this class. There is, in fact, no expectorant used in the treatment of bronchitis which may not occasionally be given in phthisis; even the balsam of copaiva is sometimes of great benefit when there is much chronic bronchitis and but little fever or gastric irritability. In most cases, however, it is much too irritating.

Venesection is rarely requisite in pneumonia attending consumption, and is almost never indicated in bronchitis. Cupping is, however, of signal benefit in the treatment of both inflammations. Intercurrent pneumonia in most cases does not need any other remedy; where an internal medicine is necessary, minute doses of tartarized antimony are much to be preferred to large ones, or to mercurials.

The treatment of pleurisy is more difficult. The intimate relation of this disease with phthisis has already been explained, and it seems a matter of more urgent necessity to remove it completely at as early a period as possible. For this purpose the usual antiphlogistic measures are indicated at the beginning of the disease, with small doses of antimony and opium, or Dover's powder, or one of these remedies combined with digitalis, according to the strength of the patient. After the acute stages have passed off, the surest remedy is the repeated application of small blisters to the affected part from two to three inches square, so as to keep up a continual counter-irritation by changing the place of their application, and renewing them as often as they heal. Large blisters are better adapted to the acute than the chronic forms of pleurisy. It is often a question whether mercurials should be given under these circumstances; it is true that they produce an injurious effect upon phthisis proper; but when the inflammation of the serous membranes

predominates very much over the scrofulous tuberculous type peculiar to the disease, mercury may be given with discretion. That is, the circumstances proper for its employment are almost limited to the pleurisy of commencing, not of advanced phthisis; and it does not seem to matter much whether the pleurisy be of that variety in which the tubercles are developed in the serous membrane, or whether they are formed afterwards in the substance of the lung. If we decide upon giving mercurials, they must be limited to very small doses, and should be given for a short time only, never producing ptyalism.

The only intercurrent inflammations must be treated as the same disorders would be if in an uncomplicated state. But gastritis and hemoptysis, or tracheitis, require a passing notice. If the gastritis occur in a healthy individual in whom phthisis afterwards declares itself, there is nothing special in its management, but it often occurs in those who have previously offered the signs of a scrofulous diathesis, and is then difficult to treat. We must then look to the constitutional character of the disorder, and must place the patient upon general alteratives, especially the hygienic, as a sea-voyage or a journey, while we resort to the usual treatment for dyspepsia.

Laryngitis is often a mere symptom of phthisis; and if it occur in its advanced stage, opiates will scarcely succeed in palliating the distress which is caused by it; the difficulty of deglutition, and the uneasy feeling at the throat, often constitute one of the most disagreeable symptoms of advanced phthisis. But the commencing laryngitis is sometimes arrested readily enough when no tubercles are yet developed. Repeated, but small applications of leeches, followed by frictions with iodine ointment, and the internal use of the solution, are the most important means. A blister behind the neck is much less certain; sometimes it is applied in front of the larynx, but little benefit results from it except in the early stages. I have not used nor seen employed the cauterisation of the larynx, by injecting a solution of nitrate of silver into it from a small syringe more than half full of air, so as to break the little stream into numerous fine drops. Dr. Trousseau gives some favourable accounts of its success; but I am not inclined to think that it is applicable

to many cases. The pharyngitis which sometimes precedes phthisis, is more easy of cure, and requires local alteratives with a general tonic treatment. When the disease is nearly removed, cold ablutions of the neck and upper parts of the breast are the best means for preventing its return. Of late years, however, I have occasionally applied the strong solution of nitrate of silver with a sponge to the upper part of the larynx, but with very little beneficial results.

There are many symptoms in phthisis which are not connected with proper inflammations, but may reach a sufficient degree of intensity to require special treatment. These are the diarrhœa, hectic fever, and night sweats. Diarrhœa and dysentery often result from proper inflammation of the bowels, and are then nearly similar to the same disease as it occurs under ordinary circumstances. But diarrhœa assumes two other forms; it may be the proper tuberculous diarrhœa which follows the softening of this substance in the follicles of the intestines, especially the glands of Peyer, or the colliquative diarrhœa which occurs late in the disease and sometimes carries the patient off very rapidly. The former variety of diarrhœa may be palliated by small doses of opiates; the latter requires the same treatment, but with less prospect of success; for when colliquative diarrhœa supervenes in the last stage of phthisis, it is almost always fatal. The astringents may be advantageously combined with opiates, especially kino, and given in small quantities, if the tongue is not dry and red, and they are not productive of gastric uneasiness. If the diarrhœa be moderate, and the pectoral symptoms have abated upon its occurrence, it is better to abstain from any active medicines, as the discharge is then to a great extent a natural drain, and more mischief would follow from its repression than could be compensated for by the temporary relief of the patient. At the beginning of the diarrhœa small doses, about two or three drachms, of the spiced syrup of rhubarb will often relieve it.

The sweats, which are so frequent in phthisis, are extremely exhausting to the patient, and occasionally require special remedies. The sweating is sometimes connected with the irritative form of early phthisis, or follows the hectic which occurs only in the advanced cases. In other cases the sweating is a

termination of a febrile paroxysm, and is in itself a mode of relief to the patient; but as it is a cause of great depression, and often prevents sleep, we are often compelled to resort to some efforts to check it. Several external applications have been proposed with this view, such as bathing the skin with a solution of alum, or some other astringent application. They sometimes succeed; but any external application intended to suppress what may be considered as a natural discharge, is fraught with danger; and whether this be sweating or the secretion from a cutaneous eruption, external astringents should, if possible, be avoided. It is much better to use no external means, other than rendering the clothes as light during the period of fever as they can be made with safety to the patient. Another useful means of moderating the night sweat is anticipating it. That is, the patient may take a hot pediluvium early in the evening, while he is still labouring under fever, and then go immediately to bed. The sweat will generally follow, and he should rise as soon as it diminishes and change his linen, and, if possible, the sheets of the bed. In this way he is almost sure of obtaining some hours of refreshing sleep. This remedy, however, like all others under similar circumstances, will fail after a time. The internal remedies used for the same purpose are notoriously uncertain. In fact, their administration is almost entirely empirical, and the most opposite medicines will sometimes succeed. That is, a remedy which produces a certain action upon the secretion of the gastric mucous membrane has generally a reciprocal action upon the cutaneous surface, and very different substances applied to the gastric membrane have the power of so modifying the condition of the whole body, that sweating is for a time suppressed. The most used of these remedies are the acids and alkalies, especially the former. The nitric or sulphuric acids are generally preferred to any other, especially the elixir of vitriol or aromatic sulphuric acid; this should be given in doses of from ten to twenty drops two or three times daily, either in some sweetened water, or in an infusion of the bark of wild cherry. Sometimes this remedy is disagreeable to the stomach, and produces various ill-defined sensations: it should then be discontinued, and a remedy of an

opposite kind resorted to. The alkalies often answer well in such cases, especially lime water, with milk, in various proportions, as may be found to suit best with the stomach of the patient. This combination may be taken with some simple biscuit as a suitable article of food, when the stomach digests with difficulty. It should not, however, be used merely as an article of food, but be taken at different times throughout the day. Although it may seem singular that alkalies and acids are both of occasional benefit in the treatment of phthisis, yet it is what is often observed in ordinary cases of dyspepsia, in which the condition of the membrane of the stomach is not very dissimilar to that in phthisis; and the same causes which render these different remedies of service in the former case appear to do so in the latter. At least this is the most reasonable explanation.

The chills of hectic fever are often extremely severe, and occur with such regularity that the sulphate of quinine has naturally enough been proposed as a remedy. Given in doses of from two to six grains before the expected chill, it will sometimes arrest it; in other cases it fails entirely, and is rather irritating to the patient than the contrary. In most cases, the best treatment is to palliate the hectic by simple attention to warmth and other hygienic circumstances at the time of the paroxysm.

There are several remedies which at one time enjoyed a reputation in the treatment of consumption, which is by no means merited. The principal of these are digitalis, hydrocyanic acid, and the acetate of lead. Digitalis was given mainly because the excessive frequency of the pulse, which constitutes so prominent a symptom in many cases of phthisis, cannot be reduced by bloodletting, while it will sometimes partially yield to digitalis. The powers of this remedy extend no further; and as the good results of it are extremely doubtful, while it is often positively mischievous, it is now almost abandoned. I have from time to time made a trial of its virtues, but without satisfactory results.

Much was expected from hydrocyanic acid when it first came into use. It is certainly a good sedative; but as the remedy is necessarily extremely uncertain, and is attended with

no little danger when the strength of it happens to be greater than usual, it is, in fact, not much prescribed. I do not, however, object to it, as it unquestionably is a good anodyne. The ferrocyanate of potassa is occasionally a good remedy, possessing some sedative powers, and to some extent controlling the night sweats: the dose which I prefer is five grains three or four times daily, gradually increased to twice that amount, should no effect follow. One of the advantages of the wild cherry bark certainly arises from the proportion of prussic acid which it contains: this is sometimes considerable enough to cause some fever, and a disagreeable sensation of fulness in the head.

The acetate of lead I have rarely used in the treatment of phthisis proper, although it is recommended for its power in checking the hectic fever. But in the diarrhœa which often occurs, it is one of the most useful remedies, given in combination with a small dose of opium, that is, in doses of two grains with a quarter to half a grain of opium four or five times daily.

The chalybeates are occasionally resorted to in the treatment of phthisis, especially the iodide of iron, which is given in doses of from ten to thirty drops of the solution two or three times daily. Few patients will bear larger doses, which are apt to cause nausea and a disagreeable feeling of constriction at the epigastrium and head. My own impressions are less favourable to this remedy than they formerly were; it certainly acts well in some cases, but fails entirely as a curative agent, and from its aptness to cause the disagreeable symptoms just referred to it cannot be given in as large doses or as frequently as would otherwise be desirable. It differs a little from other chalybeates, and possesses more decidedly alterative properties. Other forms of the same class of remedies are occasionally resorted to, and like the preparations of iodine, answer best when the patient is depressed, with little or no febrile excitement, and the constitution is feeble and deteriorated.

There are certain mineral waters which have acquired more or less celebrity in the treatment of phthisis: amongst these are some of the springs in the Pyrenees, and the Red Sulphur Springs in Virginia. These are all situated in mountainous districts,

which render the climate injurious to many classes of phthisical patients. In advanced cases, the benefit, if any result, can be but palliative; and the circumstances attending the geographical position of the springs, and the long journey necessary to reach them, should be taken into the account, before advising patients to resort to them. My own experience as to their virtues is limited to a short residence at the Red Sulphur. This is a cold and very agreeable water, containing very little saline substance, and impregnated with a moderate quantity of sulphuretted hydrogen. The analysis of the spring is found, however, not to be complete enough to render it conclusive. The most benefit was derived by patients who were in need of an alterative, especially of one which was capable of acting upon the digestive canal. Such cases appeared to derive essential benefit from the combined influence of the water and the journey; and in this way, at least, it appears to be serviceable in commencing phthisis, where the irritability of the chest is not great, and there is little or no tendency to acute bronchitis, to hemoptysis, or to pleurisy. In the latter cases the climate does not appear to me very favourable, at least not in a wet summer, when the situation of the springs renders them a damp and cold residence.

The treatment, therefore, of phthisis, is almost entirely indirect, and we hope to check the progress of tubercles by removing accidental complications, or diseases and conditions of body which favour their growth, rather than by acting directly upon the tuberculous secretion. It is, therefore, necessarily uncertain, and often fails when every thing seems to be most promising; for as tubercles themselves are manifested by but few symptoms, the greatest part of the sufferings of the patient is caused by the complications. These are often readily removed, and the patient is apt to mistake the apparent amelioration in his symptoms for a real improvement of the disease.

But though the fatal cases constitute a large majority of those in which phthisis is tolerably advanced, or has from the first assumed a character of great severity, yet there is so much left for the physician to do as a faithful counsellor in warding off the first approach of the constitutional disorder by appropriate hygienic and medicinal measures, as an active practitioner in

checking the progress of the varieties to which inflammation of the organs plays a decided part, and lastly, as a watchful friend in allaying the sufferings in those cases which are actually incurable, that the treatment of consumption is far from being as ungrateful a task as is often supposed. How far the power of therapeutics extends, is difficult to define with accuracy, but the gradual increase of our knowledge will probably furnish us with means which are of more certain application, and will certainly teach us how far the use of those we now possess may be extended.

The exercise of the lungs themselves should not be forgotten as one of the best methods of resisting pulmonary phthisis. Should the patient be in the habit of reading or speaking aloud, I have not in general forbidden the exercise, provided it was not carried to the point of fatigue, and there was no active inflammation going on. This was the case with a well known and popular preacher in the Methodist Church who consulted me some years since, with cavities actually formed, and who still fulfils his laborious duties with improved health. The exercise may in some cases be increased by protracted efforts of inspiration, but much caution is then necessary to avoid increased irritation. A mode of exercise of this kind constituted the basis of a plan of treatment which attracted some notoriety in London a few years since, but was strongly tinctured with charlatanism, and its results were evidently much exaggerated, so that its actual value was soon ascertained to be extremely limited.

CHAPTER XIV.

PNEUMOTHORAX — ANATOMICAL CHARACTERS — SYMPTOMS AND PHYSICAL SIGNS—DIAGNOSIS AND PROGNOSIS—DURATION AND TERMINATION—TREATMENT.

THERE is a lesion of the lungs and pleuræ which is rather a result of disease than a positive morbid action. This is pneumothorax, or perforation of the lung. It is true, that as soon as this accident occurs pleurisy is set up, and only differs from common inflammation in the mingling of the symptoms of the pleurisy with those of the perforation. The mechanism of perforation is very simple; in almost every case it results from tuberculous disease of the lungs, but any alteration of those organs situated near the pleura, and gradually destroying the parenchyma beneath it, may produce the same result. As soon as the pleura is left unsupported by the tissue of the lungs, it becomes of a dull white or yellow colour, and soon sloughs; a small hole forms in the centre of the dead portion, which is enlarged by the passage of air through it during the act of inspiration. The size of this opening varies from that of a pin's head to a third of an inch in diameter; it is generally of a valvular form, and allows with difficulty the return of the air from the pleura. As the air enters more easily than it passes out, it of course accumulates in the cavity, and the chest quickly increases in volume, from the quantity of atmospheric air which finds its way into it.

The air is an immediate irritant to the serous membrane, and gives rise to inflammation, which is followed by the secretion of its usual products, lymph and serum. The latter accumulates at the bottom of the cavity, mixed with a few flocculi of lymph, but the greater part of this substance adheres to the surface of the serous coat in the form of a false membrane, which extends to the point of perforation; and, in fact, closes it

completely: in which case there is no difference between empyema and advanced pneumothorax. The liquid contained in the pleura is at first merely serum, but it afterwards is replaced by pus, which is secreted by the false membrane as in chronic pleurisy.

As pneumothorax is a physical lesion which produces a rapid change in the condition and functions of the viscera of the chest, its physical signs are very evident, and are often beautiful illustrations of the accuracy of physical exploration. The immediate result of the passage of the air into the cavity of the pleura is the collapse of the lung; the inspiratory murmur therefore ceases, or is replaced by amphoric respiration, which is often heard over the whole cavity, and in other cases is limited to the part nearest the perforation; the sign is much clearer and sharper than in those cases in which it is caused by a cavity in the substance of the lung, for the walls of the chest are more elastic, and produce a clearer sound than those of an ordinary cavity. The expiration, however, is often unheard, for the opening is in many cases too small to allow the air to pass out with sufficient freedom to give much sound. In this respect the amphoric respiration in pneumothorax resembles that of very large pulmonary cavities.

The amphoric respiration often ceases after the pus has increased, and the coating of lymph has formed over the opening; and there is then either no sound, or a slight and bronchial respiration is heard at a distance near the root of the lungs.

As a necessary attendant upon the amphoric respiration, we find a corresponding resonance of the voice, which follows the same course, and ceases at the same time. The metallic tinkling is another phenomenon of equal interest. It resembles the tinkling of a pin against the sides of a glass or metallic vessel more nearly than anything else; and was at one time supposed to depend upon the dropping of a small portion of liquid from the top of the pleura upon the surface of the effusion. Dr. Bigelow, of Boston, performed a number of experiments upon the dead body; and satisfied himself that the cause of the tinkling depended upon the air forcing its way upwards through the liquid, and not in the dropping from above. The tinkling

is by no means a constant sign, and is, therefore, much less important than the amphoric respiration and resonance of the voice.

The signs of pneumothorax gradually decline as it passes into ordinary empyema, and there is then necessarily flatness of percussion, with entire absence of respiratory murmur. The quantity of pus is much greater than in common cases of pleurisy; it sometimes amounts to several gallons, and causes extreme difficulty of the respiration.

The rational symptoms of pneumothorax are by no means conclusive, but in most cases they are sufficiently well marked to excite a suspicion of the nature of the accident. They are the usual signs of acute pleurisy with extreme and sudden dyspnœa, from the rapid entrance of air into the cavity of the pleura. Their uncertainty arises from the occasional absence of pain in cases of acute pleurisy, and from the dyspnœa not being always very intense. As a general rule, however, if a patient labouring under symptoms of phthisis be taken with very sudden and acute pain in the chest, and extreme dyspnœa, there is strong reason for suspecting that perforation of the pleura has taken place; especially if the pain occur during an effort of coughing, or some other sudden shock given to the chest. It is true, that all of these symptoms may depend on acute secondary pleurisy, which sometimes develops itself, or at least shows itself almost instantaneously. The only certain test is therefore to be sought in the physical signs of the disease, which are alone to be relied upon. The pain is described as similar to that occurring in severe cases of pleurisy, as cutting or lancinating, and at first prevents the patient from lying on the affected side, but after the disease has continued for a time, the patient follows the ordinary rule of chronic pleurisy, and lies on his back or on the affected side, in order to avoid the pressure of a large quantity of liquid upon the mediastinum. The other symptoms are also those of pleurisy; the fever which follows the perforation is of the acute kind observed in cases of pleurisy, with a rapid and rather wiry pulse, followed by abundant sweats at night. After the effusion has become purulent, the fever approaches more nearly to the hectic form, and the patient complains much more frequently of chills

than he does in the earlier stages of the disease. Although he gradually loses flesh, he does not become nearly as much emaciated as in those cases in which tuberculous disease is passing through its ordinary course; nor is the disturbance of his general health nearly as great, provided he escape the first dangers of the accident. The other functions of the body are more or less disordered, but in very different degrees, and are scarcely similar in two patients. This variety depends upon the different susceptibility of individuals, which necessarily renders all the accidental or secondary symptoms of a local inflammation extremely uncertain and variable, nor can they be described except in general terms, and they are not necessary to characterize the affection.

The symptoms of the original disease causing the pneumothorax in great part remain, but are in some degree modified by it; thus the cough and expectoration diminish when perforation supervenes, for the difficulty of breathing and pain prevent a full expiration, which is necessary to a complete cough; the cough which is proper to pneumothorax is even shorter and drier than that of pleurisy, for the respiration is less complete and more painful. Of course no expectoration can arise from the pneumothorax; if there be any, it must depend upon accompanying disease of the lungs or bronchial tubes.

Diagnosis and Prognosis.— The diagnosis of pneumothorax, since the discovery of physical exploration, is amongst the most certain of those of diseases of the chest—for in a lesion of this kind the physical signs are pathognomonic; without them, the lesion may be suspected, but cannot be certainly recognised or distinguished from acute pleurisy. Physical exploration goes much farther than the mere recognition of the disease; it points out its different degrees and stages, and the gradual passage of it into empyema. The prognosis is more uncertain; in the large majority of cases it is unfavourable, and speedily fatal; but this rapid termination depends less on the lesion itself than upon the disease which has given rise to it, or on the combined influence of the two. If, for instance, one lung be almost unfitted for respiration, and the perforation should chance to occur in that which is comparatively healthy, respiration is almost interrupted,

for both lungs are rendered nearly useless, and the patient dies in a few hours or days from exhaustion and orthopnœa. The condition of the lung which is not the seat of the perforation has therefore much influence upon the prognosis. If the patient does not labour under any immediate danger from the interruption to the respiration, the prognosis is still almost necessarily fatal if the phthisis be at all advanced; but if it be confined to a few scattered tubercles it has little influence upon the course of the pneumothorax, which seems rather to retard than hasten the progress of tubercles. If the disease depends merely upon a few tubercles, and arises from the accidental rupture of a small one into the pleuræ, the prognosis is for the present much less unfavourable, but after the pleura is completely filled with pus instead of air the patient still incurs the risk attendant upon a severe empyema, and, of course, under the best of circumstances, the prospects of ultimate recovery are extremely doubtful; and as a general rule the prognosis is almost always mortal.

Duration and Termination.—The duration of pneumothorax is not fixed. It may terminate fatally in a short period (in one case I witnessed a fatal termination in less than an hour), or it may last many months; in two cases I found the fatal termination not to occur until the lapse of fifteen and eighteen months; in the latter of these cases the patient made two long voyages, and, according to his own statement, did full duty as a seaman while his pleura was enormously distended with pus. It is in this variety that the lesion is followed by empyema, and the possibility at least of recovery must be admitted.

Treatment.—The treatment of perforation of the pleura is extremely limited. The indications are to subdue the secondary inflammation, or rather to keep it within moderate bounds, and to relieve the pain. But as the patient is already much debilitated by previous disease, there is little to be done in the way of active treatment. Bleeding is quite inadmissible, but an occasional application of cups may be allowed, although with great reserve, and only in those cases in which the inflammatory excitement is very high. Blisters are much more frequently of

benefit; in fact, they are the most certain remedies for checking the inflammatory action, and often relieve the pain; they should be applied to the affected side near the seat of pain, which does not correspond in most cases precisely with that of perforation. Besides blisters, the only remedy which promises much advantage is an opiate; especially the Dover's powders, given in doses sufficient to tranquilize the agitation of the patient; and if not to secure sound sleep, at least to relieve the incessant restlessness and suffering. This treatment I have long pursued in cases of pneumothorax, and it is nearly similar, if not altogether identical, with that recommended by Dr. Graves for the treatment of intestinal perforation in typhoid fever. The opiate should be continued for some days in a full dose, and should be given in diminished quantity during the whole of the case, discontinuing its employment when the oppression increases, or the digestive powers become much enfeebled.

The proper antiphlogistic treatment of pleurisy is scarcely adapted to cases of pneumothorax; for as the cause is a permanent and mechanical one, it cannot be removed by antiphlogistic or alterative remedies, and, therefore, the progress of the secondary pleurisy cannot be retarded; but the inflammation may be modified, and the empyema, which is almost necessary to the cure of pneumothorax, should afterwards, if possible, be brought to a favourable issue.

The operation of paracentesis is sometimes allowable in two different stages of the disorder; to favour the escape of the gas, or the pus which is afterwards secreted. Immediately after the perforation of the pleura, the dyspnœa may suddenly become so great that immediate death is to be feared; the side may then be punctured in the usual way, and the gas be allowed to escape; but, as in this case, the subsequent dangers of the disease are certainly increased by exposing the cavity of the pleura so freely to the air, the operation cannot be justified except it be a measure of absolute necessity; at best, it relieves the patient only for a short time. In the cases of advanced empyema which follow pneumothorax, paracentesis may be performed where the oppression is extreme, and the intercostal spaces are much bulged

out. The operation is, however, very far from being devoid of danger, for the free entrance of the air into the cavity tends to increase the inflammation, and to aggravate the hectic fever. The usual precautions should be carefully attended to after the operation. If it be thought advisable to perforate the chest, the best mode is perhaps one that has just been mentioned to me by Dr. Bowditch of Boston, who states that he has several times performed the operation without difficulty or subsequent suffering to the patient. He uses a very small trocar, and allows the fluid to flow through it; the instrument is too small to allow of the entrance of any notable quantity of air, and in that manner all mischievous results from the operation are prevented.

CHAPTER XV.

PULMONARY HEMORRHAGE—DIVISION INTO VARIETIES—MODE OF ATTACK—SYMPTOMS—AND PHYSICAL SIGNS.

Hemorrhage from the lungs in most instances consists merely in an exudation of blood from the bronchial membrane, and is symptomatic of deeper-seated diseases of the lungs; but as it arises from several different causes, and may depend upon simple excitement of the circulation, or disease of the heart, as well as upon positive lesion of the lungs, it requires, on some accounts, a separate examination. The connection of hemoptysis with different stages of tuberculous disease has been already explained in the lectures upon phthisis; the object of the present remarks is, therefore, hemoptysis itself, considered as a separate disorder, and not a mere symptom of other pulmonary affections.

It may be divided into the hemorrhage which is purely external, in which the blood comes directly from the mucous membrane, and is discharged externally; and into another variety, in which a portion of the blood escapes into the cellular tissue of the lungs, and forms little nuclei, which are of a deep red colour, and of almost an uniform appearance. These nuclei constitutes the disease known under the name of pulmonary apoplexy, which is nothing more or less than hemorrhage from the vessels of the smaller bronchial tubes and vesicles into the cellular tissue of the lung. It is, in general, attended with a flow of blood externally; but in some cases the effusion is strictly internal, and the disease is then indicated only by the dyspnœa and obstruction to the circulation.

There is some difference as to the causes of the slighter varieties of hemoptysis and pulmonary apoplexy. The latter follows, in most cases, the sudden and violent congestions of the lung, which a disease of the heart or aorta naturally produces; or it

arises from some other equally decided obstruction to the circulation; but the hemorrhage which finds its way entirely to the surface, depends, in most cases, upon a less severe, but more persistent cause of irritation, seated in the lungs themselves.

In either variety of hemorrhage there is, therefore, something more than a mere flow of blood to the chest; there is a cause, either general or local, or both united, which determines the raptus toward the lungs, and then a discharge into the cellular tissue, and upon the surface of the bronchial membrane, or upon the latter alone. The first stage in the morbid chain is the congestion which may either occur without the effusion of blood, or with hemorrhage, into the cellular tissue, but not externally. Hence, the discharge of blood is in itself of no importance, except in the rare cases in which it is so considerable as to enfeeble the patient very much; the real mischief is the effect produced upon the pulmonary tissue. If there be an apoplectic extravasation, the mischief is more considerable, and the secondary irritation greater than when there is simply an arterial congestion, giving to the lung a bright vermilion-red colour. The secondary irritation may be merely a moderate inflammatory action in the part, or there may be in addition a tuberculous deposit; should the latter exist before the hemorrhage the congestion of the lung is simply a favouring cause, which increases the number and favours the growth and softening of tubercles.

The symptoms and mode of attack of pulmonary hemorrhage may begin in several ways. A patient may be using strong and even violent exercise, which determines a sudden rush of blood towards the lungs, and the hemorrhage then ensues,—or it may occur while the patient is perfectly quiet, as for example, when he is lying in bed, usually early in the morning. Either of these modes of occurrence may coincide with tuberculous disease, but the latter is more frequently connected with it than the former. There is no difference in the symptoms of the hemorrhage connected with tubercles or the tuberculous diathesis, and that dependent upon other causes. The cases vary only according to the severity of the bleeding, and the previous health of the patient.

The general symptoms are perfectly the same as those of other

hemorrhages; hence they require but little special attention in a chapter devoted to pectoral disease. The heart is throbbing and quick, its contraction is accompanied, in many instances, with a bellows sound, which is extremely loud and strong. As the hemorrhage is almost always of an active character, the face is unduly flushed, and the capillary circulation excited. These symptoms gradually decline after the flow of blood, except the action of the heart and arteries, which remains for a considerable time much excited.

The local or pectoral symptoms are more immediately connected with our subject. If the hemorrhage be slight, the patient complains only of a slight sense of tickling at the upper part of the trachea and the large bronchial tubes. If the hemorrhage be considerable the tickling is more constant and severe, and a sense of oppression is felt across the sternum, which seems to prevent the full expansion of the chest. As the hemorrhage generally lasts for some time before it finally ceases, the tickling sensation continues, and even after the flow of fresh blood has completely ceased the coagula continue to be expectorated, and keep up the same sensation of tickling, with the short irritated cough which naturally results from it. There is no pain from the hemorrhage proper; the pain, if it exist, depends only on the accidental inflammation which sometimes follows the hemorrhage; for the effused blood left in the cellular tissue of the lung may prove an irritating cause like other foreign bodies.

The signs of auscultation are merely a loose sub-crepitant rhonchus, heard not only at the seat of the effusion, but throughout the bronchial tubes which contain blood. The bubbles are even looser and of thinner liquid than those formed by mucus. The percussion is rendered slightly dull if there be a large apoplectic extravasation, or much congestion of the surrounding tissue. The evidence of hemoptysis does not rest, however, upon physical signs, but on the external discharge of blood; and in those rare cases in which the blood is extravasated into the cellular tissue of the lungs without appearing externally, no certain conclusions can be drawn from auscultation.

The course of hemorrhage is rarely towards a fatal termination, unless the first gush of blood should prove fatal: even this

is not common, except in advanced phthisis, when the blood comes from a large vessel crossing a cavity, and is not the result of exudation from smaller vessels and the finer bronchial tubes. This accident is then strictly dependent upon phthisis.

The *treatment* of hemorrhage from the lungs does not differ materially from that of analogous affections, excepting that it is connected with other diseases of the lungs, especially pulmonary phthisis, in which case the treatment is a mere appendage to that of this disease. There is generally little difficulty in suppressing the bleeding; but after this has been brought about our object is to prevent its return, and check the subsequent fever, which is not only attended with some danger in itself, but is a favouring cause of tubercles.

The patient should be bled from the arm if there is much excitement of the pulse: but when he is already feeble previously to the occurrence of the hemorrhage, it is best to abstain from venesection. Very often patients are bled by far too profusely, so that their strength is to a great degree enfeebled, and the subsequent progress of phthisis is rendered more rapid. Cupping is a most useful remedy; it may be either an adjuvant to general bleeding, or it may replace it, when the patient is already much enfeebled. It is also necessary to place the patient in bed, unless the attack is but slight and he has already frequent returns of it; in the latter case, he will generally know that it is not necessary for him to remain in bed. The hemorrhage may often be arrested by a few spoonsful of common salt, which may be given to the patient as soon as it occurs. The acetate of lead in doses of two grains every hour or two, with a quarter to an eighth of a grain of opium should then be given, and may be continued as long as the hemorrhage lasts. The patient should remain perfectly quiet and not speak, except for matters of absolute necessity, and then only in whispers. The other astringents of a vegetable kind may be in some cases used in place of the acetate of lead, such as the rhatany or catechu, or kino; but they are rather fitter for those cases in which there is merely a slight oozing from the surface of the bronchial tubes than active hemorrhage. The diet must be extremely rigid, and consist merely of small portions of cold vegetable substances, such as

sago, arrow-root, and the like unirritating aliment. The temperature in which the patient is placed should not be high enough to keep up the flow of blood, the room must be cold if possible, and every thing capable of producing excitement of the patient, and in this way accelerating the circulation, should be carefully avoided. Ice in small pieces is one of the most valuable remedies; the patient is generally very thirsty and takes the ice eagerly. Sometimes ice is even applied to the exterior of the thorax in a bladder, so as to act as an external refrigerant which may check the hemorrhage. But this application requires great caution and should not be carelessly used.

CHAPTER XVI.

TUBERCLES OF THE BRONCHIAL GLANDS—DIAGNOSTIC CHARACTERS—TREATMENT.

The bronchial glands are, at the early periods of life, more subject to tuberculous deposit than the lungs themselves. This tendency to tubercle exists in the bronchial glands to a much higher degree than in any other of the lymphatic ganglia. It is highly developed in children, but gradually declines as individuals advance in life; and in old age the bronchial glands are scarcely ever affected, except as a consequence of previous disease of the lungs. The relative frequency of tubercles in the bronchial glands of children compared with the lungs is not less than five to four; which is of course more than reversed after the age of puberty.

The development of tubercles in the bronchial glands occurs nearly as in other solid structures of the body; scattered points of tuberculous substance are gradually deposited in the structure of the glands, surrounded by the original tissue, which remains for a considerable time nearly in the healthy state; sometimes, however, it is swollen and more vascular than usual, but more frequently it is quite pale, and infiltrated with the gelatinous substance which is in many cases the early stage of tuberculous matter. As the quantity of tubercle increases, that of glandular structure gradually becomes less, until the whole tissue of the gland is absorbed, and is replaced by tubercle. It is then much larger than the original gland, and the capsule which encloses it gradually thickens during the process of softening. After softening has followed, adhesion occurs between the glands and the nearest large bronchial tube, so that the contained matter is evacuated by an opening into it. In most instances, however, no softening occurs, but the tuberculous matter becomes hard and dry, and is converted into a cal-

eareous substanee, surrounded by the eapsule. This substanee often beeomes extremely hard and solid, and generally remains in this state during life. The tubereulous disease of the bronehial glands is, therefore, mueh less unfavourable than that of the lungs, and is essentially eurable.

The symptoms of tubereles in the bronehial glands are extremely obseure. Indeed, they eannot, in the large majority of eases, be reeognised exeept by the signs of a general serofulous diathesis. As this rarely oeeurs in ehildren without a deposit of tuberele in the bronehial glands, we may safely infer that the loeal disease exists, if we diseover the symptoms of the general disorder. In sueh eases no possible disadvantage results from the diffieulty of diagnosis, for the disease has eomparatively little influenee upon the lungs. In other eases the tubereulous glands attain a eonsiderable size, and press upon the traehea, obstrueting the respiration, and irritating the bronehial mueous membrane. The symptoms of eatarrh, however, differ but little from those of ordinary bronehitis; the eough is frequent, but oeeurs in paroxysms, very mueh resembling, in many eases, the fits of whooping eough, and, on auseultation, it is found that the respiration is extremely feeble in one or both lungs, while the pereussion is quite sonorous. The feebleness of respiration is the only permanent sign, and depends upon the eontraetion of the larger tubes from the pressure upon them. The expirations are at times wheezing, and, as it were, protraeted, but not permanently so. As these are the only symptoms of tubereles of the bronehial glands, and are by no means limited to this lesion, the diagnosis depends at last upon the eomparison of these eomparatively unimportant loeal signs with the general indieations of a tubereulous diathesis.

The treatment of tubereles of the bronehial glands eonsists entirely in those means which tend to eounteraet the serofulous or tubereulous diathesis; we therefore trust greatly to the use of iodine and vegetable alteratives. The use of these remedies should be eontinued for a long period, if the stomaeh of the individual be not irritated by their employment; if it should be, they must be immediately diseontinued, and, after a time, renewed; free exereise in the open air, and a healthy invigorating diet, are neeessary adjuvants in the treatment.

DISEASES OF THE HEART.

CHAPTER XVII.

GENERAL CONSIDERATIONS.

The signs of the diseases of the heart are more easy, but less precise than those of the lungs. The structure of the heart is extremely simple, and its functions are very limited; while each of its surfaces is covered by a serous membrane which is the subject of much fewer lesions than the complex tissue of the lungs. The great simplicity of the structure of the heart has, however, its disadvantages for diagnosis; there is no expectoration from a mucous surface, and not the numerous combinations of rhonchi met with in the diseases of the lungs, which although sometimes difficult to recognise are, when once they are known, generally sufficient to point out with great accuracy the exact nature and seat of the lesion. So far as the signs of disease of the heart go, they are, therefore, very easy of recognition; but beyond a certain point, they do not indicate the nature of the lesion with much precision, and the diagnosis is then approximative only. The gradual researches of late pathologists have, however, removed much of this difficulty, and although we have not yet reached precision, it is more nearly attained than it formerly was; and many disorders, such as inflammation of the lining membrane, and some valvular diseases, are now much more easily recognised than they once were. This accuracy in diagnosis will probably be extended a little further, although we doubt whether it will attain absolute perfection, so as to enable us to recognise the slighter organic

lesions. However, extreme nicety as to this point is not, in most cases, of great practical importance.

The discovery of auscultation has probably done still more for the study of the diseases of the heart than of the lungs; that is, they were before this time almost totally unknown, except the description of some of the pathological lesions. The symptoms of the different affections are so nearly allied, and so often obscured by those of various disorders of the lungs that it was extremely difficult to distinguish them one from the other, or even in many cases to decide that any affection of the heart existed. The united influence of accurate observations aided by physical exploration, and of pathological anatomy, has removed these difficulties as much as the nature of the subject will admit; and now, as a necessary result, the progress of investigation has been directed to the causes which precede cardiac affections, and to the numerous secondary disorders which result from them. Thus, the disease of the heart must be regarded as the only important pathological change, and the secondary affections may be lost sight of, or regarded as mere symptoms of the cardiac lesion, not as separate disorders with their own set of independent symptoms. Thus, the congestions of the lungs, and the serous effusions into the chest, are now, comparatively speaking, rarely mentioned in writings of late observers; even hydrothorax and asthma—when they are mere consequences of heart disease—now attract little attention.

The investigation as to the causes of heart disease has produced some unlooked for results, and has shown very conclusively that in a large majority of cases, especially in young persons, they result directly from inflammation; and that even in the aged inflammation is a secondary cause which adds very much to the slow alterations of nutrition which arise merely from advance in years. As the causes are now better known the treatment of these affections has become more definite; that is, the early treatment, employed with perseverance during the commencing, or inflammatory period, before those fixed organic lesions are formed which are beyond the reach of art.

After this period, our resources are more limited, and are strictly palliative, so far as the cardiac lesion itself is concerned,

and our object is then rather to prevent the increase of the lesion and to relieve its effects upon other organs, than to remove it. We regard organic alterations which have lasted for a long time, and have become, as it were, established, very nearly in the same light as original vices of conformation, from which they differ very little. The curative treatment is then applicable only to the reactive inflammatory stage, or to the early periods of the disease, in case it is not inflammatory at its commencement. Treatment may then be active and positive in its results.

Although in those stages in which the organic lesion is fixed and has become a mere peculiarity of nutrition, we cannot directly remove it: if we merely prevent its increase we may aid the natural powers of the system to recover the balance to which they are perpetually tending. In this way a considerable enlargement of the heart will sometimes gradually diminish, until the organ is little by little restored to its natural dimensions. These cures, however, must be limited to those cases in which the diseased part is enlarged, and the new superfluous portion of structure may then be absorbed; but when there is a destruction of an important part, or an entire perversion of its tissue, a cure can in no case be expected, and the treatment is then absolutely palliative.

Symptoms of Diseases of the Heart.—These are to some extent common to all those affections, whether functional or organic, but they vary extremely in intensity, and are by no means directly proportioned to the severity or the danger of the affection. The principal symptoms which occur in most diseases of the heart are irregular and disordered action of the organ, sometimes amounting to that degree of violence which is commonly called palpitation; painful or disagreeable sensations in the region of the heart; and impediments to the circulation, causing congestions of blood and effusions of serum. Palpitation of the heart is more constant and troublesome to the patient in simple nervous disorder than in organic disease; in the latter case it is usually provoked only by violent exercise, or by some sudden effort. In the acute inflammatory cases the symptom is often totally absent. Painful sensations in the chest

are very variable; one of the most distressing is an acute pain felt near the left nipple, or at the extremity of the sternum: this pain, it is true, does not always coincide with any positive symptoms of cardiac disease, and in many cases it is plainly connected with a mere nervous disorder, or with dilatation, or with both these conditions combined. The pain is not accompanied with dyspnœa, as in angina pectoris, but it will sometimes extend across the chest or pass down the left arm. Both palpitations and pain are as often connected with nervous disease as with organic lesion; but the case is very different with the impediments to the circulation and their effects; these are almost always dependent upon organic disease, or, at least, much more frequently, and to a much greater degree than upon functional lesion. They occur in muscular derangements of structure, as hypertrophy and dilatation, but are much more decided if the valves are at the same time diseased. As a general rule they are more severe in proportion as the valves are narrowed, so as to prevent the free passage of the blood, forcing it, as it were, backwards, and thus producing congestions and anasarcous effusion, or hydrothorax. When the symptoms of heart disease have for a long time preceded the dropsy, they may be regarded as almost pathognomonic of a grave lesion, which is in these cases most frequently hypertrophy conjoined with valvular disease.

Irregularity and intermittence of the pulse attracted more notice before the discovery of auscultation than it does at present; for although this symptom is not without its value, and in reality often attends various heart diseases, it is necessarily uncertain, and sometimes occurs during the convalescence of acute diseases in which the heart is in no wise involved, while it is a congenital peculiarity in some individuals, lasting through a long life, but apt to terminate in decided heart disease. It is clearly not owing directly to the obstruction, but to the enfeebled action of the heart, which is no longer proportioned to the column of blood which it has to propel, and works in a hesitating irregular manner. Now, this may arise from causes totally independent of actual disease of the heart, but it is more apt to occur in connection with heart disease than independently of it; and in other

cases where no actual disorder is developed, the chances of future affections of the heart are certainly increased.

Causes of Heart disease.—The inflammations of the membranes of the heart not only constitute a frequent form of disorder, but they give rise to a large proportion of organic lesions. This is more especially the case with the inflammation of the internal membrane, for pericarditis has comparatively little influence in producing permanent derangement of structure. The causes of these inflammations resolve themselves into those which ordinarily produce the phlegmasiæ, and into the peculiar connection known to exist between them and rheumatic disease.

Thus, the ordinary causes of serous inflammations, such as cold and exposure sometimes give rise to, may end in pericarditis, or these may afterwards become complicated with structural alterations of the heart. Acute articular rheumatism, however, is much more important, and perhaps it is even a more frequent cause of disease of the heart than any other. It is certain that more than one half the cases of acute articular rheumatism, attended with much pain, are in fact complicated with heart inflammation. In some cases there is no obvious inflammation at the time the patient is examined by the physician, who sees merely the signs of actual disease of the heart; but in this case if we carefully inquire into the cause, we can trace back the symptoms to an acute attack of chronic inflammation arising through the course of acute articular rheumatism.

Besides inflammation, there are, however, other causes of heart disease; the muscular tissue of the organ may increase in thickness from the constant activity into which it is thrown, and organic disease is in this way developed as a consequence of long-continued nervous excitement. Enlargement of the heart may also arise from a sudden injury inflicted upon it, as a violent strain or effort, or some other sudden propulsion of the blood towards the organ which is strained beyond the power of complete recovery. The gradual advance of age has also a tendency to produce a slow enlargement of the heart, and the formation of ossific deposits in the valves or its internal membranes;

and in these cases there is at least no evidence of direct inflammatory action.

The causes of functional diseases of the heart are, of course, as various as those of all nervous disorders, and are sometimes the most opposite in their character; in general, the nervous disorders are apt to arise in cases of anemia, or of deficient muscular power, or are directly dependent upon spinal irritation or chronic gastric disorder. This is almost always the case with the functional diseases of the heart which occur in young women, from suppression or other interruption of menstruation. These patients often complain of the most violent palpitation, which is not infrequently mistaken by unskillful physicians for actual disease of the heart. The same series of symptoms is sometimes observed in young men, particularly in those who have been accustomed to a sedentary life, or to excess in study, or any other cause capable of producing partial disturbance of the heart.

Termination of Heart disease.—The acute inflammatory affections of the heart may terminate in recovery, and the patient be restored to entire health; but in many cases the disease gets well so far as the acute inflammatory attack is concerned, but the organic lesion continues. Chronic organic affections, as a general rule, do not terminate in recovery; they may end in death, or they may be prolonged without causing more than mere discomfort to the patient, and without shortening the natural duration of his life. The former termination is caused by the severity of the lesion, which may be often sufficient to seriously impede the circulation of the blood; or from the enfeebled state of the patient, and the thinness of the blood, which favour the dropsical effusions of the latter stages of these diseases. These aggravated cases vary in duration, but they generally either prove fatal of themselves, or they merely increase the severity and the danger of some intercurrent disease, so that death results from the combined influence of the chronic and the acute disease. The structure and peculiar functions of the heart increase the mortality from the chronic diseases; they are rarely single, or, at least, do not long remain so, they tend not only to increase from the continued play and action of the heart, but one will

produce another; hypertrophy will give rise to valvular disease and inflammation of the endocardium, while the converse is also true, and to a much greater degree. So that in young persons, at least, endocarditis even when it ends in recovery from the acute affection often leaves behind it disease of the valves, which, again, by impeding the circulation of the blood, forces the heart to exert itself more strongly, and at last gives rise to disease of the muscular tissue. Functional diseases of the heart have in themselves little power in shortening life, but as they are at times causes of the organic affections, their indirect influence is sometimes very pernicious.

Influence of age and sex.—The age has a strong influence in favouring the development of heart disease, while the sex is also not without its influence. Men are much more exposed to the causes of inflammation than women, and therefore suffer more from all the disorders which arise from it; they are therefore more liable to organic diseases of the heart. Nutrition is also more active in them, favouring, of course, the development of hypertrophy, and of other affections in which nutrition is in excess. As regards the influence of age, it may be readily analysed; cardiac diseases must be proportionably more numerous as we advance in life; 1st, because they are of slow growth, and form, as it were, insensibly, so that they only reach their full development after many years; 2d, because the lesions of nutrition are in themselves more frequent in the old than in the young, as is proved by the invariable and natural increase of the heart as we advance in years, even if no absolute disease be developed. Males are, therefore, more subject to cardiac diseases than females, partly from their greater exposure to the causes of inflammation, and partly from the violent efforts to which the heart is subjected in many of the laborious occupations of the male sex. This, however, holds good only with the organic diseases of the heart, for the nervous functional disorders are vastly more frequent in women, especially in those in whom the nervous susceptible character is most developed.

General Diagnosis and Prognosis.—Although accurate or special distinctions as to the precise seat of heart disease and its probable termination can only be made by studying carefully

the physical conditions of this organ, and the precise part affected, there are certain general characters of heart disease which are well known in their application to the study of these affections.

Besides the special signs of organic diseases of the heart, they are generally known by some decided symptoms which indicates that some serious mischief has attacked the organs. These are orthopnœa, a feeling of weight and stricture in the præcordia, fulness of the cervical veins, and great increase of dyspnœa in ascending a height, or a steep flight of stairs. Blueness or lividity of the lips is also an excellent sign. A thrilling pulse and œdematous effusions are also often characteristic. The irregularity of the pulse, and the violence of the palpitations are common to both nervous and organic diseases, perhaps they are more frequent attendants upon the former than the latter class of diseases. Pain confined to a limited spot near the apex of the heart is much more common in nervous affections; the same is true of a sensation of fluttering at the heart, of shortness of breath, proportionate merely to the palpitation, and differing from the violent dyspnœa of organic disease. The probability of nervous disorder is rendered much greater if the patient present other signs of a nervous temperament, especially if called into action by the usual exciting causes. The mode of origin of the disease is also important for diagnosis; if at first inflammatory, it is probably organic; or if the patient be stout and muscular, and of a family in which diseases of the heart are hereditary, or the gouty and rheumatic diathesis is very strongly developed. On the other hand, both the original constitution of the patient and the previous existence of a disease capable of disordering the innervation, may render the existence of nervous disease probable. An affection of another organ, especially of the lungs, may act in the same way, and give rise to severe disease, which at times may appear to be organic, but will be quickly dissipated if the original disease be removed. This is very frequently the case with affections of the lungs, especially if the left lung be much indurated, and thus impede the action of the heart, and conduct the sounds and impulsion both to the ear of the observer and throughout the chest.

The general prognosis of heart disease is commonly under-

stood to be highly unfavourable; hence, in ordinary language, a person who is labouring under an affection of the heart is supposed to be incurably diseased. This is no doubt true as regards the extreme disorganization of the valves, and of the internal membrane of the heart and aorta, as well as very decided hypertrophy and dilatation; but it is not true of acute inflammatory affections of the heart, or of the moderate degrees of hypertrophy. It is still less applicable to the sympathetic nervous disorders which so frequently require medical aid, and often excite the greatest apprehension. Even in those forms of disease in which a strict cure is not expected, the symptoms may, after a time, cease to increase, and even positively decline, without apparently shortening life. Hence the prognosis really depends upon a special diagnosis, and is, in fact, included in it; and if the nature of the disease of the heart is once ascertained, and its rate of increase or diminution settled, the prognosis may be defined—provided no circumstances of a disturbing kind should arise.

EXAMINATION OF THE HEART.

The heart requires to be examined under several different points of view. The most important of these are its position in the thorax, and the relative situation of the parts of it; the size of the heart, as ascertained by percussion; the impulsion; the sounds, and their rhythm or succession; lastly, the mode in which the heart acts, whether in a regular or in a spasmodic, ill-defined manner. Besides these signs, which are strictly physical, we learn much as to the diseases of the heart from the sensations complained of at the præcordial region, the respiration and the impediments to it, the capillary and venous circulation, and, lastly, the surrounding disorders of the whole body, which indirectly depend upon the cardiac disturbance.

Position of the Heart.—In general terms it may be stated that the heart is situated at the lower portion of the sternum, including nearly the whole breadth of this bone, and extending on the left of it to a short distance within the nipple; in height, the heart reaches from the intercostal space between the third

and fourth ribs, to the base of the thorax. It occupies, therefore, the anterior and lower portion of the left side of the thorax, in a definite extent, and this portion so occupied is called the præcordial region, or, in other words, the region of the heart. The exact situation of the heart, and the relative position of its different parts and valves, are readily seen by an examination of the recent subject.

Size of the Heart.—The size of the heart is known by two phenomena, the abnormal prominence often formed in cases of enlargement of the heart at the cartilages of the fifth, sixth, and seventh ribs, and the dulness on percussion which may become greater or less than it should be in the healthy state of an individual of a given stature and embonpoint. By the size of the heart, measured externally, we refer to the whole taken collectively; hence, an enlargement of the muscular substance does not differ, as regards the physical signs of measurement, from the more external distension caused by effusions of pus or serum into the pericardium. When the increase in dimensions is very considerable, the chest is thrust forwards, but the form of the prominence is different; when there is an effusion into the pericardium it is pyramidal, the apex of the pyramid at the upper portion; when it depends upon a real increase of the muscular structure, the projection is in general less marked, but more diffused, and forms an oval, the long diameter of which extends laterally, instead of vertically, as in the former case. The more exact mode of estimating enlargement of the heart is, however, by percussion. This is readily enough practised; but to render it of practical benefit, the observer should retain an accurate recollection of the average normal dimensions in an individual of the general health and condition of the patient. It is true that the general health may have a very decided effect upon the heart, as well as upon the rest of the organs, for when the health is deranged, the heart suffers with the rest of the organs, and the change is limited to a slight augmentation or diminution in size and thickness, corresponding with that of the muscular structure in general. The real advantages of percussion are much more decided when we desire to learn the condition of the heart, and its state as an individual organ. To do this we must recollect

that in the healthy individual the heart is not entirely overlapped by the lungs, but that a portion of its structure, which is chiefly composed of the anterior surface of the right ventricle, is in immediate contact with the parietes of the chest. This portion varies in extent, partly from changes in the condition of the heart and pericardium, partly from lesions of the lungs and pleura. Thus, without any actual change in the heart, the percussion at the præcordial region may be rendered very dull from induration of the lungs, or pleuritic effusion, while emphysema may distend the lungs, and render the sound preternaturally clear in the region of the heart. A little attention to the condition of the lungs will in general obviate the chances of error.

The heart itself, when diseased, often produces a decided change in the results of percussion, which then depend upon the alterations of form. In the natural state, the extent of dulness does not exceed a space of about three inches in length, measured along the sternum, and about two and a half inches laterally; that is, the dulness extends to a short distance within the nipple, and about the middle of this space, just at the left margin of the sternum, it amounts in most persons almost to perfect flatness. The greatest dulness of sound extends over a breadth of one inch and a half to two inches; that is, over the space which the lung does not overlap; so that there are two sounds of percussion —one nearest the sternum which is flat, and the other more external, which is simply dull. The difference depends upon the percussion being made in the latter case over both the tissue of the lungs and the heart. If the heart be enlarged, or if an effusion of liquid has taken place into the pericardium, the dulness is of course increased in proportion to the degree of enlargement or increase. When the dulness results from hypertrophy of the heart it is more rounded in its shape than when it depends upon pericardial effusion; in the latter case, the original shape of the serous sac is still preserved, and the space in which the dulness is most evident is pyramidal, the apex of the pyramid being towards the upper part of the chest. The mathematical exactness of this mode of mensuration is readily ascertained by a process which was very carefully pursued by Dr. Pennock a few years since; that is, forcing long needles at the limits of the

dulness, and examining the parts perforated by them after the body was opened.

Impulsion.—The impulsion of the heart furnishes one of the least complicated sets of signs connected with this organ. It is produced, as is well known, by the contraction or systole of the heart, during which the point of the organ is quickly impelled against the ribs, striking near the cartilages of the fifth and sixth ribs a little within and below the nipple. In the healthy state of the heart the blow or impulse is given almost exclusively by the point of the heart; hence the sensation is sharp and decided, as would naturally be caused by the quick stroke of a small surface against the thoracic parietes. If the heart is thrown into violent action by quick exercise, or by nervous irritability, the impulsion is increased in force, but the surface upon which it falls is still very limited in extent: should the bulk of the heart and the quantity of muscular tissue be increased, as in cases of hypertrophy, the momentum of the impulsion is much increased, but it is diffused over a much larger surface than in the normal condition of the organ, and the mass of the heart is applied slowly against the chest, as it were point after point, so as to give it a heaving or waving motion, instead of a sharp, clear impulsion. In low fevers, and in other diseases in which the powers of life and strength of the patient are much diminished, the impulsion of the heart is decidedly lessened, and its force nearly destroyed. The diminished impulsion is then a good guide in therapeutics, and affords us one of the first indications for supporting treatment. The impulsion of the heart, it is evident, can only serve as a diagnostic sign, when the patient is still possessed of a moderate degree of strength; hence, in cases in which the thickness of the muscular substance is really much increased, the force of the blow may be so much diminished by general exhaustion, that no stronger impulsion is made upon the parietes of the thorax than would result from a heart which is not at all enlarged.

Sounds.—The sounds of the heart furnish us with one of the most important means of diagnosis, but require to be studied in the healthy state before becoming of practical use as signs of disease. The sounds of the heart are two in number, and are de-

signated as first and second sound. The first occurs during the systole or contraction of the heart, and is synchronous with it; it is the longer of the two, and occupies a little more than one-half the whole period of the heart's action, and consequently the first sound may be heard during one-half of the life of each individual. It is described as prolonged but dull, and it may be very readily learned by placing the ear over the heart, while the hand is applied to the pulse of the patient; the vibration of the artery and the sound are perceived at the same time, although the sound of the contraction precedes a little the pulsation of the wrist, but the difference is so slight as to be scarcely perceptible. The cause of this sound is differently explained; probably it is not a single cause, but a combination of two, which may in part account for any difference of opinion. The principal cause is certainly the muscular contraction of the heart, which is abundantly capable of producing a sound, as may be verified by experiments upon the hearts of animals. Take the heart of a calf or sheep from the body after sensation has been destroyed, but before the animal is quite dead, and by applying a stethoscope upon it, a sound will be distinctly heard, which is identical with, although weaker than, the first sound of the heart; in this, there is of course no cause for the sound but pure muscular contraction. But in the living body it is very probable that the sound is in part produced by the friction of the blood against the semilunar valves of both aorta and pulmonary artery; this cause, however, which is not so easy to demonstrate, is by no means so powerful as the muscular contraction. The second sound is the proper valvular sound, and is shown by direct experiment to be caused by the quick contraction of the semilunar valves, especially of the aorta, which are much stronger than those of the pulmonary artery. If these valves be tied by passing a needle through them in the heart of an animal deprived of sensation, but still living, the second sound is immediately destroyed. The character of the sound is totally different from that of the first; it is very short and sharp, and is properly designated by the term clacking. It follows immediately after the first, and is synchronous with the diastole of the heart; when the semilunar valves are diseased, or prevented from acting by the excessive turges-

cence of the heart with blood, the second sound is weakened or destroyed. After the second sound a period of repose, occupying nearly one-fourth of the time of each complete action of the heart, succeeds, and is again followed by the first sound.

The sounds of the heart are, as may readily be seen, very regular in their succession and proportion, and when these are deranged a disturbance of the heart's action may be fairly inferred. Should the change be very decided and permanent the cause must nearly always be sought in the valves themselves; but if slight and temporary, it is often a mere muscular or functional disturbance not dependent upon organic disease.

The sounds of the heart may be altered in several ways; they may be changed in character, or merely diminished or increased in intensity. The alteration of the sounds may be limited to a slight harshness, or the natural tone may be totally changed; these characters, however, differ only in degree, and not in any really important respect.

The first sound is most frequently altered. When simply increased in loudness, it depends either upon a temporary condition of the heart—that is, a simple febrile movement or nervous action, in which case the sound will after a time subside to the natural state—or it arises from a hardening of the muscular structure of the heart, perhaps conjoined with slight obstruction of the semilunar valves. In the latter case the increased loudness, or, to use an equivalent expression, the roughness of the sound may continue for a very long period.

If the roughness is increased, it passes into the bellows or rasping sound. The former of these is less marked than the latter; but a bellows sound may be defined, and it is generally described as a prolonged and purring sound, usually heard in the first sound of the heart, and therefore produced chiefly by muscular contraction, although it may also arise from alterations at the auriculo-ventricular valves, and then it occurs during the diastole of the heart. Like all sounds, it is much more easy to point out than to describe in words. As a short definition, the term bellows sound, which is given to it from its resembling the sound produced by blowing strongly in bellows, is probably as good a description as any other. The bellows

sound is often produced by simple nervous disorder of the heart, especially in those cases in which it is connected with anemia or chlorosis, and it then is very loud and almost musical in its tone; and, far from being confined to the heart, it may be distinguished along the whole of the large arteries, especially the carotids and subclavian, by applying the stethoscope opposite to them. The pressure of the stethoscope has probably some influence in favouring the production of the sound at the carotids, but is insufficient to account for it; so that we are obliged to ascribe it to the peculiar motion impressed upon the thin and watery blood by the spasmodic action of the heart. When the bellows sound depends either on a hypertrophied ventricle urging the blood very rapidly through a narrow or non-dilated semilunar valve, or driving it back through a dilated auriculo-ventricular opening, it is more persistent, more uniform, and is less musical, but more harsh than when it it arises from a mere nervous disorder; the same character is found when the sound is heard during the diastole from regurgitation through the semilunar, or contraction of the auriculo-ventricular valves. Still it is in many cases difficult to distinguish between the bellows sound of mere functional disorder, and that dependent upon organic disease, unless there are some other signs of a permanent lesion.

The rasping sound of the heart is much rougher than the bellows sound, and is tolerably well described by the term which designates it—resembling the sound of a rasp forced through soft wood more than any other sound. It never depends upon simple functional disorder of the heart, but arises from some actual obstruction to the circulation of the blood, seated at the orifices of the heart, and is therefore dependent upon changes in the valves. It may arise from acute as well as chronic disease; when the obstruction is acute, it is the result of endocarditis, and the thickening of the valves is partly caused by depositions of lymph, and partly by thickening of the fibrous tissue, which forms the body of the valve, and, as the inflammation declines, the sound will gradually decrease, provided the morbid product has not become completely organised, in which case the rasping sound may be permanent. The sign is

scarcely ever heard during the diastole of the heart, for it requires a considerable force in the current of blood, and the act of dilatation is rarely sufficient to produce this at the valvular orifices. Such is not, however, the case when the aorta is much dilated, for the reflux of the blood is almost as powerful as its forward current, and the rasping is therefore double, like the forward and backward motion of a saw rather than of a rasp; hence it is then called the sawing (*bruit de scie*) instead of the rasping sound, and is one of the best diagnostic characters of aneurism of the aorta. The double movement and the accompanying sound are so peculiar that it can scarcely be mistaken for any other sign. The saw-sound is heard also at times when the mitral, or the tricuspid valve is much altered, and altogether changed in form, so as to destroy its functions and convert the auriculo-ventricular opening into a rough passage for the blood.

Another sound closely connected with the heart, or rather the arterial system, is the humming-top sound, the *bruit de diable* of the French writers. This is distinctly heard in cases in which the blood has become very thin and watery, by placing the stethoscope over the carotid arteries. It is not properly connected with disease of the heart itself, but depends upon the thin and watery condition of the blood. The character of the sound is very exactly indicated by the name it has received.

Not only the sounds of the heart, but the rhythm or succession of them offer points of interest for diagnosis. It is very clear that as the sounds are, in a normal state, separated by well-marked divisions of time, a disorder of the rhythm or succession can only arise from some material obstruction to the action of the heart and the play of its valves, or from some decided functional disorder. The latter can produce only a moderate disturbance; such as irregularity in the relative rapidity of the pulsation, with occasional interruption of a single beat; or, at most, the heart may pulsate in an intermittent manner, a pulsation being from time to time absent, at intervals, which recur with some regularity.

The distinction between an irregular and an intermittent action of the heart is mainly the recurrence as to time of the latter symptom, and the variableness of the former. An inter-

mittent pulsation of the heart is congenital, or nearly so, with many individuals, lasting through a long life without much disorder of the general health; but, if we watch these individuals narrowly, we shall find that most of them at last suffer in some way from organic diseases of the heart. The temporary irregularity of the pulsation is much less important. Under many circumstances it is rather a favourable symptom, and occurs frequently at the termination of acute diseases, especially of those which have a definite duration, such as the exanthemata. There are other cases in which the irregularity is really a pathological symptom, but refers to another organ than the heart. This is the case with inflammations, or other diseases of the brain, which in many stages of their progress are attended with irregularity of the pulse. There is, however, another set of cases in which the irregular action of the heart is a sign of disease of the organ itself, and if it be connected with other and more decided indications of inflammation, or more permanent organic alterations, it has its value. But as, in itself, irregularity is insignificant, the importance of the symptom in the study of heart disease is extremely slight.

There is another alteration of the rhythm very different from those just alluded to, and of much graver moment. In fact, it is almost confined to organic valvular disease, and mainly to concretions at the mitral valve: the proportion, as well as the peculiar character of the sounds, is then nearly destroyed, and we have a confused churning or purring sound, without any distinction of the first or second. So complete a destruction of the ordinary sounds of a healthy heart indicates the gravest lesions, and is generally connected both with dilatation of the cavities and disease of the valves.

The purring sensation (*fremissement cataire*), often felt as well as heard at the region of the heart, belongs almost as appropriately to this part of the subject as to any other. It is a sign of gravity, because the total change in both impulsion and sound which accompanies it can scarcely occur without both valvular and muscular disorder, and a free passage is opened for the blood, which is thus broken into many currents. The regular action of the heart is broken up, because there is no

longer a uniform point of resistance, nor of repose; for the stream of blood is no longer cut off by the valves. The term purring is quite characteristic of the sign, both as descriptive of the sensation of touch and of sound.

Another important sign of the diseases of the heart is derived from the mode of its contraction. Instead of the natural contraction we may find it to be quick, jerking, and spasmodic, or it may be confused and indistinct. These are peculiarities very difficult to describe, and only to be appreciated by one who has been long practiced in the observation of the healthy heart. After a knowledge of the natural contraction is acquired any deviation from it becomes very apparent. When the internal membrane of the heart is inflamed, the contractions lose their sharpness and distinctness, and succeed each other in a confused jerking manner: the sign is much the same in cases in which the valves are much diseased, especially when there is great dilatation of the auriculo-ventricular openings. Indeed any decided organic lesion of the heart modifies the natural action, and even functional disturbance of it to a certain extent produces the same effect, but in a less degree, and for a less period of time.

The next part of our subject leads us naturally to the study of the individual diseases of the heart.

CHAPTER XVIII.

PERICARDITIS—ANATOMICAL CHARACTERS—PHYSICAL SIGNS—GENERAL SYMPTOMS — DIAGNOSIS — PROGNOSIS — CAUSES — TREATMENT.

THE frequency of pericarditis has been known only of late years. It was formerly supposed that it was a very rare disease, and attended with symptoms of great severity, terminating in most instances fatally. Later investigations have, however, proved that such is not the case, but that pericarditis is an extremely frequent disorder, not much more severe in many instances than pleurisy, and very often not recognisable by any rational symptoms. The most important of these researches were those of Dr. Louis, published in the year 1826. He then thought that the only conclusive evidence of previous pericarditis was adhesions between the two surfaces of the serous membrane, but it is now ascertained that in most instances of slight pericarditis there is merely a deposit of white opaque lymph in patches upon the surface of the heart, and not an actual adhesion. The observations of Dr. Louis did not, therefore, in all probability, include more than a very small proportion of cured cases of the disease.

At first, the only evidence that pericarditis was curable depended upon the traces left behind it, and discovered in the bodies of patients dead of other diseases; but as the symptoms of pericarditis became better known it was recognised in most cases during life, and could be traced throughout its whole course unto complete recovery. As before attention was directed to the subject it was believed that it was always, or nearly always, attended with severe and dangerous symptoms; it is now known that, in the great majority of cases, the symptoms are but slight, and that not unfrequently the disease cannot be recognised; or, in other words, it is latent, except through the

aid of the physical signs. There are even some slight cases in which the latter are by no means conclusive, so that very few disorders are as often overlooked as pericarditis. It is, therefore, the more necessary to pay close attention to the signs which can be detected, otherwise the slighter forms of the disease may pass almost insensibly into more severe and dangerous varieties.

The *anatomical lesions* of pericarditis are similar to those of other serous membranes, with slight differences depending upon the peculiar structure and situation of the membrane. At first the natural serous secretion is but little altered, and is even less abundant than usual, so that the surface of the serous membrane becomes preternaturally dry. Almost at the same time, or soon after the inflammation has begun, a slight formation of lymph takes place, at first in the form of little points or dots scattered over the surface of the membrane, which gradually become more and more numerous, until they unite in one uniform membrane, and cover the whole surface of the pericardium. The lymph is in this stage soft, not much thicker than wrapping paper; when it becomes more abundant certain portions sink in the form of shreds to the lower part of the liquid, and the coating which remains attached to the heart becomes roughened, and assumes a honey-combed appearance, which depends upon the continual motion of the heart, and the drawing asunder of the two coats of false membrane. After the process of cure commences the serum is first absorbed, as in other cases of inflammation of serous membranes, and the false membranes become consolidated into newly-formed tissue. This assumes the appearance of ordinary serous membrane when it forms partial adhesions between these two surfaces of the membranes; of cellular tissue when the adhesion is so extensive as to block up the whole or a large part of the cavity, and prevent the passage of serum between the two opposing portions of the pericardium; of opaque white patches of firmer tissue, sometimes semi-cartilaginous, which form a close adhesion to the membrane, but may still be removed from it by strongly scraping with a knife: or lastly, of a simple opacity of the membrane depending, not upon a deposit on its surface, but on the effusion of new matter in its substance or beneath its adherent surface.

The process of absorption, after the more acute periods of the inflammation are passed, is generally more slow than that of effusion; but if there is little lymph, and a large proportion of serum, it sometimes takes place with great rapidity. If the quantity of effused liquid continue to increase the disease generally terminates fatally, from the excessive dyspnœa and the impediment to the action of the heart. If the disease pass into the chronic form the condition of the liquid is changed, and becomes gradually purulent, as in other cases of serous inflammations.

The injection of the vessels of the pericardium is similar to that of other serous membranes. At first it is confined to a few dots and arborizations in the membrane, but gradually increases, until nearly the whole surface is of a bright arterial redness, covered with a fine vascular net-work. If these vessels be minutely examined they will be found to be situated in that part of the serous membrane which adheres to the cellular tissue; the serous surface is still smooth and nearly transparent; in the same stage the lymph may be removed from the surface, and leave it transparent until adhesions begin to form; then the transparency and smoothness of the surface are gradually destroyed; so that blood, and afterwards vessels, are formed in the lymph, and inosculate with those of the membrane. It is evident, therefore, that the question whether the serous membrane is really thickened or not, depends merely upon the application of the term membrane; if it be confined to the external layer it is very certain that it is not rendered opaque until a late period of the disease; but there is an actual thickening of the internal or adherent layer.

The inflammation of the pericardium is very rarely of a tuberculous nature; this complication is, however, occasionally met with, and the anatomical characters are then quite similar to those of tuberculous pleurisy.

Symptoms.—Pericarditis, like other pectoral affections, is recognised in part by local and physical, and in part by general symptoms. The physical signs of pericarditis are quite as conclusive as those of any other pectoral affection when well developed; but when the disease is slight, and attended with but little serous effu-

sion, they are often insufficient for accurate diagnosis. These cases, however, constitute but a small proportion of the whole number. The signs depend upon the physical properties of the effused liquid, and the changes in the action of the heart proper. As the physical lesions are greatest in those cases in which the liquid is most abundant, the signs are then the most decided.

They are as follows: 1. *Signs of conformation.* The liquid, if in large quantity, will of course distend the walls of the chest, and give rise to a fulness in the præcordial region. This is rather pyramidal than oval in shape, and extends from the diaphragm, or base of the chest, to the third rib, if the quantity of liquid amount to a pint or more; laterally the fulness extends to the nipple, or sometimes it may even pass a short distance beyond it. The rise is very gradual; hence it requires careful inspection, in many cases, to discover it.

2. *Percussion.*—The evidence furnished by this mode of investigation is much more conclusive. If there be a decided prominence in the præcordial region, the percussion is of course flat to the same extent; for the prominence depends upon an effusion of liquid between the walls of the chest and the heart, thus forcing the lung aside, and destroying the healthy resonance of the chest. Percussion is, therefore, of immense value in those cases in which the effusion is large; but when there is little or no liquid, and the effusion consists almost entirely of lymph, there is comparatively little dulness, at least no more than would be caused by a heart moderately hypertrophied.

3. *Auscultation.*—The necessary effect of a large effusion of liquid is to compress the heart and impede the freedom of its action; the organ is also removed to a greater distance from the walls of the chest, which, of course, makes the sound less distinct to the observer. Hence the natural effect of pericarditis is to render the sounds of the heart distant and feeble; in some cases to so great an extent that they can scarcely be distinguished. The sounds are most feeble in those cases in which the effusion is greatest, for if there be lymph and no serum, the diminution of the sounds is much less perceptible; and, in some cases, the first becomes really louder, but more or less altered, and of a bellows or rasping character. The bellows sound is, however,

rarely produced by pure pericarditis, but depends, in most cases, upon the inflammation of the internal membrane, though not in all, for any great disturbance of the action of the heart may give rise to a bellows sound. The rasping sound is not found in pure pericarditis. The sounds of the heart gradually resume their ordinary distinctness as the inflammation abates and the effusion is absorbed.

In certain stages of pericarditis another sound occurs which is similar to that heard in pleurisy under the same circumstances; it is a slight friction sound, compared by some writers to that produced by the bending of two pieces of new and rather stiff leather. This description is as exact as any other, and if attention be paid to the termination of the systole, and the commencement of the diastole of the heart, it will be readily detected when present. At first it requires some attention to distinguish the creaking from the proper cardiac sounds, for it is not very loud in many instances. In other cases it is so distinct as not only to be readily heard, but even to communicate to the hand a decided quivering sensation. The sound may of course occur either in those stages of pericarditis in which the liquid is almost absorbed, or in the early stages of the disease when little or no serous effusion has taken place.

The local symptoms of pericarditis, other than the physical signs, are extremely irregular; in many cases the pain, which is often so severe in inflammations of the serous membranes, is totally absent,—hence pericarditis has been so frequently overlooked; or the pain may be limited to a very slight feeling of uneasiness, not causing any decided suffering. In a few cases the pain is much more severe, and may become extremely acute, oppressing the action of the heart, and preventing the free motion of the organ; these cases are the severe ones which at one time passed as the type of pericarditis. The dyspnœa is extremely variable, but, as a general rule, is much more moderate in simple cases than in those which are complicated with inflammation of the internal membrane of the heart. As the symptom is not at all limited to pericarditis it is of little value in diagnosis, and does not often reach an intense degree except in those cases in which the inflammation is not only extended to

both membranes of the heart, but includes the lungs or their membranes.

Cough is a symptom which is rarely absent in the inflammations of the serous membranes of the chest, but it is very slight and short in all of them, and especially in pericarditis, which, of course, involves the lungs only indirectly, and has comparatively little action on the bronchial mucous membrane.

The local signs of pericarditis are, therefore, remarkable for their great irregularity and total want of proportion with the progress of the inflammation or its extent. In this respect, pericarditis resembles other serous inflammations, and is even yet more uncertain in its symptoms.

The general symptoms are still more obscure; indeed, no diagnosis can be made from them. In all serous inflammations they are not proportioned to the severity of the local disease; and in pericarditis, the connection of the organ affected with the pulse destroys the value of the symptoms dependent upon it. Obscure and doubtful as it is, the pulse is the only one of the general symptoms which furnishes a guide in pericarditis; the thirst, the loss of appetite, and cerebral symptoms are completely secondary, and often totally absent; when present, they depend merely on the degree of fever, and are strictly proportioned to it. They may, therefore, be properly passed over without special notice, unless in a monograph, which must contain all the symptoms met with in the course of the disease.

The circulation may be perfectly regular, and present nothing abnormal, both in the arteries and capillary vessels. In a number of cases of pericarditis, especially if of a subacute or scrofulous kind, the pulse does not rise above eighty in the minute, and is soft and regular, while the capillary circulation is equable, and the face scarcely flushed. In other cases of pericarditis, a different effect is produced upon the circulation, the pulse is extremely irregular and very small; these cases are, it is true, generally complicated with endocarditis, but this connection is not invariable, for pericarditis itself will sometimes so much impede the action of the heart, that the pulse is scarcely felt. Between these opposite conditions of the pulse there are many intermediate degrees, and often slight irregularity; but as a

general rule, the pulse is smaller than in most other inflammatory diseases, because there is a direct impression made upon the muscular action of the heart. The capillary circulation is at times much loaded, and the face extremely flushed, or even livid, as in other cases in which the circulation through the heart and lungs is much impeded. There is, therefore, nothing peculiar to pericarditis in this condition of things; but, on the contrary, as the variety of symptoms is great, and as the difference in their intensity is such that the disorder varies from a really trifling and latent affection to one attended with the greatest oppression and the most intense anguish, we are obliged, as has been already stated, to look to the physical signs as the only certain means of diagnosis. The other symptoms serve to confirm or to limit the diagnosis, but cannot form the foundation for it.

The prognosis of simple pericarditis is in general favourable, a very small proportion of cases proving fatal. The exact number cannot be ascertained with accuracy, because so many of the slighter varieties pass unnoticed. Taking the severe and mild forms together, five per cent. would probably be a near approach to an accurate estimate of the fatal cases. The cases which prove fatal are generally pericarditis complicated with endocarditis, or sometimes with severe pleurisy or pneumonia. In these cases, the fatal termination it is manifest is rather to be ascribed to the complication than to the proper disease.

The effects of pericarditis are not in general productive of much ultimate mischief if the disease is not complicated with endocarditis. In this case the real mischief depends upon the latter affection, which leaves behind incurable affections of the valves of the heart. If the pericardium be but slightly inflamed, no possible mischief can result from the slight deposit of lymph causing merely an opacity upon its surface; but if the inflammation be extensive enough to leave behind considerable adhesions, they will, to some extent, impede the action of the heart, and thus may favour the formation of organic muscular disease.

The causes of the disorder are either those of ordinary serous inflammations of the chest, or acute articular rheumatism. The

latter disease is the more frequent cause of those severe varieties in which there is much pain and other obvious symptoms; but the slighter cases are generally produced by exposure to cold and damp. The renewal of the causes of the disease is apt to produce a repetition of the attacks, until at last the inflammation becomes complicated with endocarditis, or organic alteration of the heart.

The *treatment* of pericarditis is simple, more so, perhaps, than that of pleurisy, as the extent of surface involved is less considerable, and the membrane is removed to a very little distance from the surface, which renders the action of local depletion much more certain. The treatment in severe cases which are generally complicated with endocarditis must be extremely active; that is, a large and full bloodletting should be followed by a free cupping or leeching within an hour or two, provided the patient has reacted. If the patient has been in previous good or tolerable health, and the circulation of the skin is active, I prefer cups; under other circumstances leeching is necessarily prescribed in preference. The uneasiness is generally relieved, though rarely removed by these first applications. If the pericarditis predominates, it will then be better to continue local bleeding by repeated applications of cups instead of venesection; but if the inflammation of the internal membrane plays a prominent part, repeated venesection is often necessary in the early periods. In no disease can we trace the powerful and immediate effects of cupping so clearly as in pericarditis; the effusion often diminishes immediately, and the action of the heart becomes fuller and more equable. The most obvious benefit does not appear, however, in those cases in which there is much effusion, but rather in the early or dry stages of pericarditis, when there is merely intense vascular excitement, and some secretion of lymph, but very little serum.

If the effusion be large, blisters are a much more effectual means of removing it than cups or any other vascular depletion. They exert the same power in pericarditis as in other cases of serous effusions, and tend, at the same time, to check the further progress of the inflammation, and favour the absorption of the effused fluid. If the disease becomes chronic, they may be re-applied at short intervals.

The internal medicines are generally less potent than those applied externally. They differ little from those used in other serous inflammations; the most powerful are, of course, the preparations of mercury, pushed so as to produce a rapid ptyalism. In my own practice I have preferred the combination of calomel, ipecacuanha, and opium, to any other form. The ipecacuanha and opium are soothing, and tend to give temporary relief to the patient, while they do not interfere with the action of the mercury, which is the strictly curative agent. The usual dose is half a grain to a grain of calomel, and the same quantity of ipecacuanha, with a quarter of a grain of opium, every two hours. If the disease is not violent the mercury need not be given so frequently. With the commencement of ptyalism, or just before it, there is usually a decided diminution of the symptoms; and often a rapid absorption of the effused liquid takes place.

Digitalis has long been used in the treatment of pericarditis; and with considerable advantage in the chronic forms of the disease when there is much liquid of a thin serous character. In cases complicated with endocarditis the digitalis also acts well; but it is so difficult to produce a full and rapid action of the remedy, that it is not safe to trust to it except as an aid to more efficient means. Tartarized antimony is also of benefit; but as its action is less certain than that of mercury it should be used only in connection with it to favour its action, or to diminish the activity of the circulation before the mercury has had time to produce a full impression. Like the digitalis, it is most fitted for those cases in which the internal membrane of the heart is involved. Besides, it is always of decided disadvantage to produce vomiting; we must, therefore, take care to avoid this if we wish to give tartar emetic. It should not be given in larger doses than the eighth or the sixth of a grain every few hours.

These measures will generally succeed in violent cases of pericarditis; the slighter ones are relieved by the same treatment, and, indeed, terminate favourably under almost any circumstances.

The hygienic measures necessary in pericarditis are simple

enough. Entire rest, abstinence from all stimulants, and almost from food, with a careful avoidance of mental emotions, are necessary in the acute cases. Even in the less violent or more chronic varieties, the patients should carefully avoid such excitants as act especially upon the heart.

The treatment of chronic pericarditis differs but little from that of the acute. General bloodletting is, however, inadmissible, except in a few rare cases, in which the excitement rises nearly to acute inflammation. Repeated cupping, blisters, and occasionally other counter-irritants, are more useful than any other remedies. The repeated but careful administration of digitalis is, in this case, of more benefit than when the disease is more acute. Lastly, mercurials in small doses will generally complete the cure.

CHAPTER XIX.

ENDOCARDITIS—ANATOMICAL CHARACTERS—SYMPTOMS—CAUSES—DIAGNOSIS—TREATMENT.

It is now perfectly well known that inflammation of the lining membrane of the heart gives rise to the greater number of diseases of the valves, and indirectly to alterations of the muscular structure. This fact has been proved in two ways; first, because a large number of cases of inflammation of the heart which have ended in partial recovery have given rise to valvular diseases in individuals who were before in the enjoyment of good health; secondly, because the traces of previous inflammation can be detected in most instances upon the examination after death of the bodies of those who have died with various valvular diseases, or with hypertrophy of the heart. The experience of every one who has seen much of these diseases verifies this conclusion; and we are therefore not only obliged to modify our opinions as to the treatment of these affections, but to study the phenomena of inflammation of the lining membrane with more interest than we should perhaps feel if its consequences did not extend farther than the immediate attack.

Anatomical Characters.—The anatomical characters of inflammation of the lining membrane, that is, endocarditis, are less distinct than they otherwise would be, because the products of the inflammation are not contained in a closed sac which retains them until their absorption. On the contrary, they are exposed to the washing of the current of the blood, which removes all those depositions which are not either intimately combined with the lining membrane of the heart, or formed beneath it. Hence, we can have no collection of pus or serum, although we find some traces of the more solid portion of the lymph, and we may discover other alterations of structure which result from inflammation, such as thick-

ening or ulceration. When inflammation begins the membrane is highly injected like other serous tissues, the injection depending upon minute vessels and extravasated points of blood immediately beneath the surface of the membrane; that is, upon its adherent portion. A cloudiness of the membrane is soon preceptible, and it gradually becomes of a dull whitish tint, from a thin coating of fine lymph, which adheres so completely to the membrane as to become almost a part of its substance. Upon the valves we often find the lymph thrown out in a different form; in that of granulations or vegetations of a cauliflower form, which were at one time absurdly enough supposed to depend upon a syphilitic virus; these are the depositions which are most apt to become organized, and to form different kinds of valvular disease. In the cavities of the heart the lymph is nearly always thrown out in the form of delicate laminæ, which give a whitish appearance to the membrane after the cure of the endocarditis. Ulceration is by no means of unusual occurrence at the valves, and sometimes takes place at other portions of the lining membrane. The ulcer appears to arise from a small abscess formed beneath the lining membrane, which gives way after a time, leaving an opening with irregular everted edges of an intensely red colour. When these ulcers take place at the valves they often give rise to an irregular vegetation, partly consisting of lymph, partly of calcareous matter. I have sometimes seen them projecting towards the interior of the heart to the length of half an inch or more; one or even two of the divisions of the semilunar valves are subject to another alteration, which in some cases seems to be connected with inflammation; they become thin, give way to the pressure of the blood, and their fibres separate.

The muscular structure of the heart in all probability suffers more or less during a severe attack of endocarditis; but it is difficult to demonstrate what the lesion is, for the disease is evidently of a rheumatic character, and does not tend to the formation of pus. The heart, however, evidently increases in consistence, and becomes harder than usual immediately after the inflammation of the membrane has ended.

The consequences which often result from endocarditis are, however, extremely important. When in the course of the in-

flammation the valves are much affected, they often remain much altered in form after it has subsided. These alterations arise, in part, from the deposition of lymph upon the internal membrane; after the inflammation has passed off the valves remain much thickened, because the lymph adheres closely to the membrane and becomes almost incorporated with it, causing permanent thickening. The valves are also altered from ulcerations, which, of course, by removing a part of the tissue give rise to permanent changes, and render the valve less in size than it was originally. In other cases the alterations of form depend upon a corrugation or shrinking of the tissue, which necessarily becomes a permanent lesion, continuing long after the acute inflammation has passed away.

Symptoms.—The physical signs of endocarditis are in some cases extremely well marked. In the most severe forms of the disease the heart is distended with blood, which forms coagula, often becoming completely organized before death. Hence the sound of percussion becomes duller than usual, but of course it can never be so dull as in those cases of pericarditis in which there is a large serous effusion. The impulsion of the heart loses its sharpness, the contraction becoming spasmodic and confused. The sounds are always changed in character; the first is usually roughened, and either bellows or rasping; the second dull and indistinct. In many instances the heart acts so languidly, and the coagula obstruct the passage of the blood so much, that the sounds are scarcely heard; but if the muscular force be but little impaired, the first sound is almost always of a bellows kind, but usually more dull or veiled than in simple valvular obstruction. This is particularly the case where there are large coagula, but as there are cases of endocarditis in which the quantity of blood contained in the heart is, comparatively speaking, small, the disease is then chiefly limited to the valves, and we may have an intense bellows or even rasping sound. The same circumstance, that is, the distension of the heart by coagula, is one cause of the feebleness of the impulsion; and if the muscular energy of the heart be once impaired so as to permit a larger quantity of blood than usual to accumulate, a much greater energy would be required to free itself of the mass which interposes a

new and mechanical obstacle to the muscular contraction. But if the heart be not much distended, or if there be not a sudden diminution of power from the violence of the inflammation, the contraction is often strong and exaggerated in endocarditis, at least there is generally something anomalous in its character, and it differs from the equable action of a healthy heart.

The general symptoms of endocarditis are often very obscure, quite as much so as those of pericarditis; that is, in extreme cases they may be violent, but in the larger number they are moderate, and scarcely to be recognised without physical exploration; in another class they are so slight that the disease is nearly if not quite latent. The pain may attend it like other inflammations, but if there is no accompanying pericarditis, and no extreme obstruction to the passage of the blood, it is often quite slight, or even absent; when there is pain, it varies much in its character; sometimes it is very acute, and referred directly to the heart: that is, it is a true serous pain, but in other cases it is diffused over a large portion of the chest. Dyspnœa is also a frequent symptom, often violent, and causing intense suffering, with lividity of the lips and nostrils, and other signs of obstructed capillary circulation. In such cases, which are few in number, the patient has a haggard, wild expression, and the suffering may be more intense than from any other form of orthopnœa. The pulse sometimes affords very decided signs of endocarditis; it is then very small and irregular, but generally tense. This may be termed the type of the pulse in this disease, but how many exceptions do we find? The irregularity generally indicates a severe form of the disease, and usually depends upon valvular concretions. No other symptoms than those just mentioned are at all frequent in endocarditis; the organs of the body, other than those of the chest, scarcely sympathise in the disease, except at a very late period, or when the fever is much more severe than usual. The brain is, therefore, quite clear in most patients, at least at the early periods of the disease.

The termination of endocarditis is favourable in the large proportion of cases; we know that such is the result, not only from the symptoms in those cases which have recovered, but because the internal membrane bears evident traces of previous inflam-

mation in many individuals who have died of various acute diseases unconnected with the heart. In severe cases, that is, when the valves are much altered, the disease is highly dangerous and often fatal.

Causes.—Endocarditis, in the majority of cases, is rather an an effect of previous inflammatory disorder than an independent disease. Hence, it occurs in the second stage of pneumonia and in acute inflammatory rheumatism. In neither of these cases does it often give rise to much pain or other symptoms which would direct attention to the heart; and it is therefore difficult to ascertain that the disease exists without the aid of auscultation. It seems that in the diseases mentioned the inflammation of the lining membrane is to be ascribed to the action of the blood upon the membrane; that is, this fluid is charged with fibrine, and rendered highly stimulating to the internal coat of the heart. This explanation must, however, be received with some caution, for we do not find that all inflammations give rise to endocarditis; which is rare, for example, in pleurisy. Still, in acute rheumatism, and in pneumonia, the blood certainly becomes more highly charged with inflammatory elements than it does in any other disease; and we may, therefore, think it highly probable that the endocardium is inflamed because it is in continued contact with a highly fibrinous blood. Endocarditis may sometimes be referred to the usual causes of inflammation, such as exposure to cold, local injuries, or the like; but at least in nine-tenths of the cases of this disease is it to be referred to acute rheumatism or pneumonia.

Diagnosis.—The inflammation of the internal membrane may be confounded with that of the pericardium, or of other serous membranes of the chest. When endocarditis is the only disease the diagnosis is comparatively easy; for the dyspnœa, which is extreme under such circumstances, not being accounted for by any other disease except inflammation of the internal membrane of the heart or aorta, may be referred to one of these sources. When complicated with pneumonia or other inflammations, the only symptoms of endocarditis which can guide us in the diagnosis are the physical signs and local symptoms, such as pain, intermittence of the pulse, &c. These are sufficient when both

sets are present, but if one or two symptoms only are developed, the diagnosis is merely probable. It is not, however, so difficult as might be imagined; for as the disease is generally severe enough to give rise to a certain number of symptoms which are limited to the heart, the question is at last reduced to that of deciding between pericarditis and endocarditis.

In many cases these diseases cannot be separated, for they coexist, and we may have the physical signs of both affections, or if the pericarditis be dry, the signs may be simply those of endocarditis. The distinction then becomes unimportant, for the disease, at least as far as both prognosis and diagnosis are concerned, is identical.

Treatment.—The treatment of the disorder in the early stages, or in every stage, provided the powers of the heart have not sunk, is very simple; that is, full bleeding will produce relief in almost every case of moderate inflammation; in the more severe varieties the relief from bloodletting is not less decided. If the pain or dyspnœa persists, the bleeding may require to be repeated several times, especially if the first bleeding be not well borne at first, although relief afterwards follows; for the heart will support the loss of blood with comparative difficulty until it is relieved of the congestion, then the bleeding may be proportioned to the degree of inflammation. In violent cases of endocarditis, bloodletting cannot be dispensed with, except at the certainty of extreme suffering, and the probability of danger; in mild cases the remedy is less positively necessary, for patients get well without being bled and without much suffering. Still, a depletory practice is certainly the surest means of preventing the consecutive disease of the valves, which is the most constant danger in endocarditis.

Local depletion is not quite so efficient as in pericarditis, but it is still capable of relieving patients who are too feeble for bleeding; in mild cases it is often quite sufficient, especially in those of chronic hypertrophy, in which the patient is from time to time attacked with inflammation; such persons are often accustomed to have recourse to repeated cupping with the certainty of relief. Cups bear repetition much better than bloodletting. As to the counter-irritants, as blisters and the like,

the advantages of them are much more problematical; except towards the decline of the inflammation, where there is pain remaining after the oppression has in a great degree ceased, they are comparatively of little benefit; but under the circumstances just mentioned they are of unquestionable service; a blister sometimes dissipates the remains of the disease with extreme rapidity.

The usual internal remedies for the treatment of endocardial inflammation are nearly similar to those already mentioned under the head of pericarditis. As the disease is more obstinate and more deeply seated, the usual remedies are less certain in their action. As in pericarditis, at the early stages of the disorder, we trust mainly to small doses of antimony and opium as the best adjuvants to the immediate antiphlogistic agents, provided the force of impulsion of the heart be strong; otherwise antimony is a dangerous remedy. The good effects of mercury in the declining stages of the disease, are nearly similar to those of this remedy in pericarditis; the constitutional impression should be induced slowly with small doses, unless the disease becomes extremely acute, when a prompt and decided treatment will become necessary.

There is another class of internal remedies, not directly antiphlogistic, but of great service in the management of endocarditis. These are the antispasmodics, combined in some cases with digitalis. The latter remedy should be used cautiously; the advantages of it are almost limited to those cases in which the action of the heart is tumultuous and spasmodic, but not deficient in force; but in many cases and stages of endocarditis, the muscular power of the heart fails, and digitalis is totally inappropriate. In these cases, the lac assafœtidæ, with twenty drops of Hoffman's anodyne, or a few drops of the ammoniated tincture of Valerian, will often calm the action of the heart, and at the same time assist it to relieve itself of the blood which is constantly accumulating, menacing the patient with death by asphyxia.

After the active period of the disease has been safely passed, there still remains in many cases some evidence of disturbed action in the heart; the pulsation may be irregular and spas-

modic, and a slight exciting cause may give rise to palpitation and other disagreeable feelings at the heart. This condition arises partly from the nervous disturbance which remains after the inflammation has been subdued, and partly from the real alterations of structure which must remain after an organ has been inflamed. There is, therefore, a double line of treatment to be pursued; the action of the heart should be kept as quiet as possible by a careful abstinence from all ordinary excitants, whether moral or physical, and if the inflammation should return, a new resort must be had to local means, with the addition of digitalis conjoined with an antispasmodic. But a very simple diet, and an avoidance of exciting causes, will be usually of themselves sufficient to prevent any serious mischief from these slight returns of the symptoms.

An error is sometimes committed in the treatment of endocarditis as well of other affections of the heart. Depletory measures, including abstinence, are sometimes too long persisted in; there is an irritable condition of the heart which often remains after inflammation, and is necessarily aggravated by very low diet and bleeding. The remedies, in this state of things, are well known; a moderate diet, with some vegetable tonic, especially the cold infusion of the wild-cherry bark, will generally relieve it. Gentle exercise should be allowed after the disease has almost entirely subsided, but at the earliest stages of it, while the patient is still much indisposed, exercise of any kind will excite the action of the heart, and ought to be carefully avoided.

CHAPTER XX.

HYPERTROPHY OF THE HEART—VARIETIES—ANATOMICAL CHARACTERS—CAUSES—SIGNS AND SYMPTOMS—PROGRESS AND TERMINATION—TREATMENT.

The heart, like all hollow organs, is subject to thickening or hypertrophy. The disease is rather one of slow nutrition than of any active disturbance, never occurring in a very short time, and resulting either from the effects of various acute diseases which have left more or less permanent lesions after them, or from some long-continued stimulant to the circulation, or impediment to it, acting slowly upon the organ.

Hypertrophy is divided into three varieties. The first, or simple hypertrophy, is that in which the thickness of the muscular tissue is increased, without much alteration of the valves or dilatation of the cavities. This variety lasts for a very long period, and in many cases seems scarcely to shorten the life of the patient, or to produce much disturbance of the functions. It is rather a favourer of diseases of other organs than a cause of death by the immediate derangement of the action of the heart. The second variety is neither common nor very important. It is termed concentric hypertrophy: the thickness of the walls of the heart is increased, but only in the interior, so that the size of the whole organ does not appear at all, or, at least, much greater than usual, while the walls are found to be much thickened if they are cut into, and the cavities proportionally diminished, the thickening taking place mainly at their expense. If this lesion is carried to a great degree it will produce a decided impediment to the circulation; but, in practice, this degree of alteration is rarely met with, at least to a sufficient extent to produce any well-marked symptoms. The third and last variety is hypertrophy combined with dilatation,

the most severe and the most intractable variety of this disease. The danger partly arises from the direct effects of the lesion, and partly from the complications which generally precede and aggravate the hypertrophy. Like the other, this variety is slow in growth, but from time to time it takes on a sudden and rapid increase from attacks of acute inflammation of the serous membranes of the heart.

Anatomical Characters.—The anatomical characters of hypertrophy vary so far as the size and conformation of the heart are concerned; but they possess several characters in common. The tissue of the heart is not always increased in thickness although its volume is augmented, but it is simply spread over a larger space, remaining very nearly of its usual thickness, although it becomes harder and more resisting than the natural muscle,—in some cases nearly as firm and as difficult to cut as cartilage. The colour of the heart is redder than usual, and even in those cases in which the patient has become anæmic the redness persists for a very long period after the other tissues of the body have become pale. The shape of the heart remains nearly natural in concentric hypertrophy, but in the simple, and still more in the dilated variety, the organ becomes more rounded, and approaches to the spherical form.

Causes.—These vary according to the nature of the lesion. In the simple variety the cause is generally mild and slow in its action, producing a gradual increase of nutrition. Sometimes the heart is disproportionately large from original conformation, or from some unknown cause acting in early life; but in general the disease rarely occurs until after puberty, and the proportion of cases becomes greater and greater as the patient advances in life. Active muscular exertion, especially if conjoined with powerful action of the muscles of the chest, which impedes the respiration and circulation, frequent attacks of slight muscular rheumatism, nervous disorder of the heart, and acute inflammation of the organ badly cured, may all give rise to this variety. The causes of the second are unknown, but they are more frequently referable to inflammation, or to slow rheumatic attacks, than to any other. The third variety is nearly always more or less connected with inflammation, if not depend-

ant upon it; sometimes it commences during an attack of endocarditis, but in most instances it occurs afterwards, and is then caused by the obstruction to the circulation which results indirectly from the valvular thickening occurring during the acute attack. The heart is thrown into violent action by the effort necessary to force the blood through the thickened valves, or to repel it backwards when the opening is permanently dilated. There are other cases, although less frequent, in which no acute cause can be discovered, and the hypertrophy results either from long-continued muscular efforts, or from slowly acting irritation, especially gout or muscular rheumatism.

Signs and Symptoms.—The physical signs of hypertrophy are generally quite conclusive. In the simple varieties, they belong exclusively to the lesion itself, but when the heart is dilated the signs are more or less mingled with those of valvular disease and of dilatation. In simple hypertrophy we have three well-defined physical signs: the first of these is the increase of the impulsion. The force of impulsion depends partly upon the quantity of muscle and partly on its power or activity; and, as in hypertrophy, the size is necessarily increased, while the tissue of the heart becomes stronger and firmer, there is necessarily an increase in the power of impulsion, which is only lost when the energies of all the muscles decline on the near approach of death. The impulsion is not only increased in force, but in extent, the heart evidently applying itself over a larger surface, and raising itself gradually against the ribs with a heaving motion, which is totally different from the short, quick stroke of nervous or functional disturbance. In other words, the observer feels that there is a positive increase of momentum dependant upon a large mass pressing against the walls of the chest. In all the varieties of hypertrophy the increased impulsion forms one of the most characteristic signs, but it is of course less in the concentric than in the other varieties, in which the size of the organ, considered as a whole, is increased. It is greatest in some cases of hypertrophy with dilatation, in which the walls of the heart are excessively thickened. The increased force of impulsion may be readily calculated by a reference to a normal and an

hypertrophied heart; in the natural state, the thickness is not usually more than a third to half an inch measured at the middle of the left ventricle, which we generally take as the standard. The normal thickness of course varies just as that of any other muscle of the body, depending upon the general development of the individual, the sex, stature, &c. Hence, the heart is rather thicker in males than in females, and in those who have followed laborious employments than in persons who have led an idle, inactive life; in the well-nourished than in those whose digestion is impaired, or diet insufficient.

The mode in which the impulse is formed is also peculiar; instead of a short decided stroke, it is heaving; that is, point after point of the heart is applied against the walls of the chest, which gives to the observer the sensation of a large massive organ, and not simply increased energy and rapidity of blow. As the total size of the heart is greater in hypertrophy with dilatation than in any other variety, the heaving motion is then, of course, most perceptible.

The sounds of the heart are more or less changed in hypertrophy: even in the most simple variety the sounds become less sharp, especially the second, and the first is more or less prolonged, approaching insensibly to the bellows sound. In some cases the second sound disappears entirely; in others it retains its natural distinctness; and in the third variety it may even become louder than natural; for as the necessary effect of dilatation is to increase the loudness and sharpness of the second sound, the deadening effect of the hypertrophy is more than neutralized. In such cases we often find a prolonged and rough bellows sound, while the second is clear and distinct, but the valves must of course in this case remain in the normal condition.

The degree of hypertrophy may also be measured by percussion and by the prominence which is almost always produced after a time. The prominence is most readily formed in young persons whose cartilages are elastic, and yield readily to the long-continued efforts of the heart beating against them. Like the enlarged heart, the prominence is more or less oval in shape, and is of course much greater in those cases in which hypertrophy

is conjoined with dilatation than in the simpler varieties. In some cases it is very distinct, but we must take care not to confound the cases in which a slight prominence exists naturally with those in which it is dependant upon the hypertrophy. In the latter case it is generally better defined, and limited to the situation of the heart.

The results of percussion are much more satisfactory; not only do we ascertain the actual limits of the heart, but we can, with much accuracy, ascertain if the thickening is particularly great at the centre of the organ. In such cases the dulness of sound is replaced by complete flatness over the centre, and although the extent of dulness may not be increased much beyond its natural limits, it may become so much more evident, and so much greater in degree, that our diagnosis is equally sure. In cases where there is no dilatation, the degree of dulness at the centre of the heart is very great, and it then is a much better indication than the mere extension of it.

The sensations felt by the patient in the chest are at times a good guide for the diagnosis. If the chest should happen to be narrow and the heart more or less compressed, the strong impulsion is proportionably much more distressing to the patient, who then complains of the violent throbbing; but a full, capacious thorax with firm ribs, is by no means so apt to feel the impulsion, and the thickening may go on to a great degree without causing much uneasiness; in general the patient suffers much palpitation whenever he attempts to exert himself, as by walking quickly up stairs, or ascending a hill, or if he is under the exciting influence of moral causes, or, in fact, from any circumstance which quickens the motion of the heart. Frequently he is obliged to stop suddenly, and the heart may then be felt violently palpitating. Besides the palpitation, there is often much suffering from dyspnœa, which arises partly from the difficulty of expelling the blood from the heart, if the auriculo-ventricular valves should be patulous, or the semi-lunar valves contracted, and partly from the secondary effects of this impediment, which congests the lungs and prevents their full expansion. Pains are also complained of from time to time; these are directly dependant upon the disease, and are vague and wandering, sometimes

extending down the left arm, as in other diseases of the heart, or they are secondary, and depend upon the accidental attacks of inflammation of both serous membranes of the heart, which are almost sure to recur from time to time. In many patients there is scarcely pain, but merely a vague sense of uneasiness, at times scarcely felt, at others more resembling that of a weight pressing at the region of the heart.

The vascular system is necessarily affected in cases of hypertrophy. The arteries are strongly distended by the powerful action of the enlarged heart, unless the aortal valves are contracted, when the pulse may become small and irregular; this, however, results from the latter cause, and not from the hypertrophy itself, which always tends to increase the firmness and fulness of the pulse. The capillary system feels the impulsion as well as the arterial, and congestions often occur at different parts of the body; hence the subjects of hypertrophy are liable to hemorrhages, especially from the nose and the lungs, to hemorrhoids, and to apoplexy of the brain and lungs. The hemorrhages become less frequent as the strength of the patient declines, and the congestions connected with them become more passive in their character; but in the early periods of the disease the natural effect of a strong impulsion of the heart is nearly always perceptible upon the capillary system. The passage of the blood through it becomes obstructed, and external hemorrhage is a natural mode of relief; but if it should chance to be internal, though this is a similar effort of nature to relieve the vessels, it often becomes a cause of death. The veins are very little distended in simple hypertrophy; like the rest of the vascular system, they are generally well supplied with blood in the early stages of the disease, but they do not present any marked pulsations unless the tricuspid valve should yield to the continual stretching of its fibres, when regurgitation is apt to take place, and, of course, pulsation of the veins follows. The dilatation of the valve and distention of the veins are most apt to occur in the third variety of hypertrophy, because it must participate after a time in the general enlargement of the cavities of the heart.

The disorders of other organs than the heart nearly all depend

upon the abnormal condition in which the whole vascular system is placed; and result mainly from the fulness of the capillary system. Thus, cephalalgia is a very frequent accident; when it occurs, it is usually contusive, deeply seated, and accompanied with giddiness, flushing of the face, and other signs of active congestion. This symptom frequently is connected with a strong tendency to cerebral congestion, and sometimes to actual apoplectic effusion. But as soon as the blood has become watery, congestion of the brain scarcely takes place except after exercise, mental excitement, or other causes which excite the circulation. Absolute rest will almost always prevent it. The tendency to congestion of the lungs has been already mentioned as a thoracic symptom: still it is secondary to the disorders of the heart proper, and only indirectly connected with the disease.

The viscera of the abdomen rarely escape. The disorder of the liver is much more frequent than that of any other organ of this cavity; in its simplest form it is a mere engorgement, the distention of the vessels of the organ arising from the difficulty in the venous circulation; hence the organ enlarges, is indurated, and of course interferes with the due performance of digestion, and, to a certain extent, impedes respiration. But if the engorgement continue, the usual change in the condition of the liver takes place, its nutrition is deeply altered, the acini in part enlarge and become indurated, and in part are pressed upon by those which are already increased in size: it loses the deep-red colour of early congestion, and assumes a yellowish tint; in other words, decided cyrrhosis is formed. The symptoms proper to the liver, as jaundice, &c., are often developed, and the case might be mistaken for one of original disease of this organ, unless the attention is drawn to the history of the symptoms and their evident starting point in the heart itself. Flatulence is another frequent symptom; it seems to arise from the disordered digestion which often accompanies hypertrophy, and is more marked than in other affections, because the impediment to the action of the heart, which arises from the distended abdomen, causes extreme dyspnœa. The kidneys frequently participate in the disorder; generally they are not diseased until the liver

has previously suffered, and the affection then becomes a triple one, which is almost always followed by dropsical effusion much earlier than the uncomplicated disease of the heart. The disease of the kidneys ends, if it does not begin, by the peculiar alteration of the cortical substance known under the name of granular degeneration, which is singularly analogous to the cyrrhosis of the liver, and seems to depend much upon the same causes.

Progress and termination.—In most cases, hypertrophy, if of the kind connected with dilatation, tends to pass to a more advanced stage, and the progress of the disease is, therefore, towards a fatal termination. This is generally the case at an earlier or later period, unless the patient avoid all causes which are capable of producing a quick and excited action of the heart. Death may take place in one of two ways: either suddenly, especially when the circulation is hurried for the moment, or more slowly, from gradual exhaustion and dropsical effusions. In the more simple varieties the progress of the disease may be often arrested, and even in the worst cases of these varieties it is so slow that it scarcely shortens the ordinary duration of life, unless it should produce some secondary disorders of other viscera, such as the liver or lungs.

Diagnosis and Prognosis.—This evidently depends mainly on the physical signs; for, though the oppressive palpitations and disagreeable sensations of the patient are all more or less indicative of the disorder, none of these signs are sufficient; even when taken together they are rather uncertain evidences of the disease. The physical signs depending on the measurement of extent, and of impulsion, are much more easy and certain, and can rarely lead into error. The chances of mistake are, in fact, reduced almost to nothing if the physician examine the patient at several times and find that the signs vary but little. For the strong impulsion of a hypertrophied heart is very different from the quick jerking motion of one that is merely excited by some temporary functional disturbance. The prognosis of hypertrophy is so completely dependant upon the progress of the disorder as to require very few remarks. If the patient retain a full vascular system, without suffering from extreme dyspnœa on moderate exercise, and without a constant tendency to visceral

engorgements, the prognosis is least unfavourable. If he become anemic, and still suffer from much palpitation and oppression, the prognosis becomes extremely grave, for the strength declines while the local disease continues unabated. The rapidity of increase of the heart, and the ossification of the internal membrane also increase the danger, especially if the latter occur in the valves of the heart, as well as in the arteries.

Treatment.—Hypertrophy being either originally a disease of nutrition, or becoming so after a previous inflammatory disorder, it is very clear that no active antiphlogistic treatment can be decidedly curative. Indeed, all treatment is simply moderative, designed to check the stimulation of the heart and allow the natural powers to recover themselves, and if possible to regain the balance which is lost.

The principal indication is, therefore, to keep the heart as quiet as possible by withdrawing all unnecessary stimulants, and by moderating that excess of action and of nutritive life which it has already acquired. Many of our most important means are, therefore, strictly hygienic, and these are amongst those whose utility is unquestionable.

A patient who is affected with hypertrophy must be informed that no sudden cure is possible, and that the amelioration of his symptoms must depend in a great measure upon the energy of his will, and his perseverance in watching the influence of stimulating agents upon the heart. He should carefully avoid all active violent exercise, carrying heavy weights, or even walking fast, all extreme mental agitation, the use of stimulating drink, or of an exciting highly animalized diet, coffee, tobacco, and other nervous excitants, amongst which excessive venereal indulgence is one of the most pernicious. Moderate exercise by walking, driving, or riding at an easy pace, is not to be forbidden, except for a short period during some temporary excitement of the heart, and the diet should not be extremely rigid; it must be plain but sufficient, with animal food in moderate quantity once daily.

In moderately severe cases, the hygienic treatment, with the occasional application of cups to the region of the heart, will best insure the comfort of the patient. Cups may be used whenever the action of the heart becomes oppressed, or its impulsion

decidedly increased. General bloodletting will produce relief under the same circumstances, and is habitually resorted to by many patients; but there are some decided objections to its repeated employment. If prescribed frequently for the relief of slight cardiac disturbance, it must be again resorted to whenever the necessity returns; and it will be required more and more often as the patient becomes more feeble, and the blood less rich; for it is a general law, that venesection will relieve a chronic disease of the heart by lessening the quantity of blood which obstructs the action of the organ, while it increases its irritability and enfeebles the patient. It is, therefore, really a necessary evil. The objections to the use of cups are by no means so strong, nor does the application of them produce the same necessity for their frequent repetition.

In all cases in which the disease is not positively active, we restrict our remedies to those just mentioned, but from time to time the hypertrophy seems to advance rapidly, the patient suffers more, and the throbbing is almost incessant. This results from accidental inflammation, or from temporary excitement. Bloodletting is then sometimes necessary to relieve the oppression, but it must be regarded as a purely temporary remedy, not to be repeated unnecessarily, or carried to a large amount. After a moderate bleeding to diminish the violent throbbing of the heart and arteries, the patient should keep as quiet as possible during the attack, not taking active exercise of any kind. By these means the temporary excitement may in general be speedily removed.

The use of digitalis is at times indicated, but, like bloodletting, it is better adapted for the removal of temporary attacks of palpitation and excitement than for the radical cure of the disorder. If it be administered for a long period, it either loses, in a great degree, its peculiar control over the heart, or it must be urged to an extent which is dangerous, from the uncertainty of its action when accumulated in the economy. For these reasons I have in a great measure abandoned the digitalis as a permanent remedy, restricting it to a few cases in which it acts powerfully in small doses; and even in these cases I prefer giving it with assafœtida or camphor, to prescribing it alone.

But when the hypertrophied heart is excited, either from inflammation or other causes, digitalis is safe and highly useful as an adjuvant to more certain antiphlogistic means. It may be prescribed in the usual doses of ten drops of the tincture three or four times a-day, or two-thirds of a grain at the same intervals. I have never in these doses seen any inconvenience result from it where its action was watched. The infusion as usually prepared is extremely uncertain, but if it be made carefully, and of given strength, with the addition of a sufficient quantity of sugar to make it into a syrup, it is more powerful than the tincture; but as it sometimes acts with excessive energy I now rarely use it, and do not think it should ever be prescribed. After the temporary excitement of the heart is quieted, the digitalis may be laid aside for a time, and again resumed when a like necessity arises.

The object, then, of the treatment, is to remove the causes which increase the tendency to hypertrophy; to keep the heart as quiet as possible, and to arrest the causes which hasten the progress of the disease by giving a new activity to the growth of the organ. The clothing of the patient must be carefully attended to; without being oppressively warm, it should obviate as much as possible the rheumatic attacks which favour heart diseases.

CHAPTER XXI.

DILATATION—ANATOMICAL CHARACTERS—CAUSES—SYMPTOMS—DIAGNOSIS AND PROGNOSIS—TREATMENT.

This is enlargement of the cavities of the heart. One variety of it is, as we have already seen, connected with thickening of the parietes of the heart, and is, therefore, properly considered as belonging to hypertrophy rather than to dilatation; but it also occurs as a distinct lesion, and then the parietes of the heart are in general not only free from thickening, but are rather thinner than natural. It is in itself by no means a formidable disease, but as it often is connected with different organic lesions, or with embarrassing nervous disorder, it may indirectly prove to be a source of great annoyance and even danger to the patient.

The causes of dilatation are nearly the same as those of hypertrophy; but, in the latter disease, the general state of the individual is more disposed to active nutrition of a semi-inflammatory kind, while in dilatation the force of resistance of the heart is in a great degree lost, and the organ becomes thinner and weaker. Hence it is more frequent in anemic individuals, especially in chlorotic girls, than in any other class of persons, just as hypertrophy is more frequent in males. The tissue of the heart is paler and more flaccid than in hypertrophy, and there is very rarely that complication of endocarditis or pericarditis which renders the membrane of a hypertrophied heart so often opaque and thickened. The degree of dilatation is very various; it never, in the simpler variety, reaches nearly to the degree observed in the cases complicated with hypertrophy, for the plain reason, that the powers of the muscular structure of the heart would yield to the continual stretching unless it were increased in thickness: hence, there is a natural law of the economy that a dilated hollow organ tends to hypertrophy. Dilatation, then,

often ceases to be simple, from the natural operation of this law. The organic lesions most frequently conjoined with dilatation are the disorders of the valves, especially the auriculo-ventricular. These are more frequently extreme patescence than thickening and contraction, and in some cases of dilatation the symptoms begin so suddenly, and with so much force from the first, that it would seem that one or more of the chordæ tendineæ had given way, producing a sudden inability of using the valves.

Physical Signs.—The physical signs are less marked than those of hypertrophy. The percussion is rarely dull to the same extent, as it depends merely upon the blood contained in the heart, and not on the addition of solid muscular structure: it must, however, necessarily be more dull than usual, and the dulness will extend over a greater space. There is no prominence, for the heart has not force enough to act upon the ribs and oblige them to recede. The chief signs, however, of dilatation are the changes in the sounds of the heart. The thinness of the parietes increases the sharpness and loudness of the first sound, much as the thickening of hypertrophy renders it dull and less distinct; it therefore approaches, to a certain extent, the sharpness of the second sound. The latter is also increased, and becomes much more clacking than it is in the healthy heart. The rapidity of the heart's action is in most cases increased, sometimes to a very great degree, and slight causes produce palpitation.

General Symptoms.—Pain is not unfrequently complained of by the patient; sometimes it is sharp, but in general it is like the pain in most cases of organic disease of the heart; that is, dull and indistinct. When the pain is most severe, the case is generally complicated with functional disease of the heart. The disturbances of the capillary circulation of various organs, which are so apt to occur in hypertrophy, rarely take place in simple dilatation, so that the vascular symptoms of this disease are less evident.

As dilatation occurs chiefly in individuals of a nervous temperament, often more or less anemic, many disturbances are apt to occur in the nervous condition of the patient; hence neuralgia in its various forms, and hysteria are frequent complications.

There is no other symptom properly dependant upon the disease, but a large number of functional disorders may either precede or accompany it, and modify the action of the heart. Hence, complications of this kind are purely or nearly accidental. The most important is the general feebleness of the patient; as long as this continues the action of the heart is rarely restored to its normal state, for the functional disturbance keeps up, as it were, the symptoms of dilatation.

Diagnosis and Prognosis.—The diagnosis of dilatation, and the organic diseases of the heart, is not very difficult; but it is often extremely embarrassing to decide between it and nervous disorder; that is, to ascertain how much of the symptoms is owing to each of these causes. The distinction depends on the signs of dulness found in dilatation, and the permanent loudness of the sounds of the heart, which is much greater than in the nervous disease; still it will often be exceedingly difficult to decide whether a heart which is the subject of great functional disorder is dilated or not. A hasty opinion must not be formed under such circumstances; but by attention to the progress of the disorder its true character will be developed. In this, as in other diseases of the heart, the functional affections are more or less temporary, the organic alterations are much more permanent; and although they may subside for a time they do not entirely disappear, unless a real recovery should occur. The prognosis of the disorder offers little of interest; it is scarcely fatal of itself, but as connected with other disorders it may undoubtedly exercise a certain agency in favouring and hastening their progress. A patient scarcely ever dies of simple dilatation.

Treatment.—In dilatation, as well as in hypertrophy, the treatment is not active, so far as our means of acting directly upon the heart extend. Our object is to tranquilize the action of the heart, and to support the strength of the patient, if, as often happens, it be much enfeebled. The pain which sometimes attends dilatation may be relieved by small blisters over the region of the heart, and to the spine, in those cases in which the action of the heart is in a great degree kept up by spinal irritation. Blistering, or other revulsives to the spine, may

cure the patient of the palpitation, and the dilatation will then present few symptoms of importance. The action of the heart in dilatation is not powerful enough to require the use of large doses of digitalis; if this remedy be administered it should be given only for a short period, and in very minute doses, conjoined with aq. camphoræ, or lac assafœtidæ. Hoffman's anodyne answers very well for the same object, as a temporary tranquilizing remedy. The use of these various remedies is readily learned, when it is remembered that the power of the heart should not be diminished, but that its irregular action merely should be checked. For the same purpose a rigid adherence to hygienic rules becomes necessary, and they should be nearly the same as those required for the treatment of hypertrophy. But as the nervous stimulants are more to be dreaded in dilatation than the more permanent excitants of the heart, the patient should carefully abstain from tobacco, tea, coffee, and avoid the mental and physical excesses which disturb the regular cardiac action. Those which act through the passions, or debilitate the nervous power by excessive fatigue from indulgence in sensual gratification, or undue culture of some of the faculties, are the most injurious.

If anemia complicates dilatation of the heart, a long-continued use of tonics, especially the chalybeates, constitute the best mode of treatment. The prescription which I formerly preferred, as a general rule, was Valet's proto-carbonate of iron, in doses of three to five grains, with half a grain of rhubarb and a grain of ginger; of these pills, the patient may take from three to four daily. A still better preparation is the metallic iron, or the iron per hydrogen as it is sometimes called, given in very small doses, as two grains three times a-day. The infusion of Prunus Virginiana, is an adjuvant to the chalybeate remedies of great value, and often succeeds in quieting the action of the heart. Cold bathing, sea-bathing, and other tonics of this nature, are all necessary from time to time, and may be prescribed with advantage, as they tend to strengthen the general muscular system, and to increase the nutrition, without exciting the irritability of the heart.

CHAPTER XXII.

DISEASES OF THE VALVES—NATURE OF THE DISEASE—SIGNS AND SYMPTOMS—DIAGNOSIS—TREATMENT.

The valves of the heart are subject to derangements, either from the direct effect of inflammation, or chronic alterations of nutrition, or the combined influence of these causes. When the valvular lesion occurs during the active progress of endocarditis, it is evidently a mere part of the inflammation, and is produced by the same action of the bloodvessels as other alterations of structure of serous membranes. The valves are altered by deposition of lymph upon their free surface, under the form of vegetations or granulations, and by thickening from an albuminous deposit between their thin laminæ; lastly, from bony degeneration, which follows cartilaginous thickening. The vegetations produce not only thickening, but also roughness of the surface of the valves; while deposits between the laminæ of the valve indurate and thicken without destroying its polished surface. Bony concretions of course produce great obstructions to the passage of the blood, and in some cases are as important lesions as more recently formed vegetations.

These changes produce alterations of function; that is, as the valve changes its form it becomes incapable of closing completely and preventing the reflux of the blood; or it becomes morbidly contracted, forming a projection inwards towards the cavity of the heart, obstructing more or less the circulation of the blood. In most cases it can scarcely be said that the opening of the valve is simply contracted or dilated; for a permanent thickening destroys both the form and functions of the valve, and converts it into a rigid abutment, which does not yield itself completely either to the

movements of dilatation or contraction; hence the orifice of an indurated valve is generally both dilated and contracted, neither closing nor opening so as to give a free passage to the blood.

The form assumed by the lymph when first thrown out during inflammation is various; sometimes it is in small points or granulations, at other times it forms excrescences, singularly like, in appearance, to venereal warts; hence they are sometimes called cauliflower vegetations, while in a third variety the lymph is spread out on the internal membrane with which it is intimately combined, giving to it an opaque white tint. In other cases, the effused matter is secreted into the thickness of the valves, and of course is situated between the folds of the membrane which forms them. This matter is replaced in many instances by ossific deposits, which are formed in the usual way beneath the lining membrane, which often ulcerates, leaving the bony spiculæ projecting towards the cavity of the heart. The structural alteration of the valve, in some cases, takes place immediately after, or even during the inflammatory process; in others it is only formed after the inflammatory action has subsided, and the affection becomes limited to a mere alteration of nutrition. In both cases the action of the vessels is the same; and when the lesion is once formed it scarcely diminishes afterwards.

The valves of both sides of the heart are liable to disorder; but there is a great difference in this respect. Those of the left side, according to the usual law as to the relative frequency of inflammation in the arterial and venous structures, are diseased in the large majority of cases; that is, about nineteen times in twenty, especially in those cases in which the alteration is positive or active in its nature, and depends upon increased nutrition. The giving way of the valves which follows long-continued dilatation, is quite as apt to take place on the right side in the tricuspid as in any other valve. The valves of the left side are often both affected at the same time; hence the semilunar and mitral are usually both diseased; in other cases, one is decidedly altered while the other nearly escapes, but it is very rare to find it in a normal state. They both participate in the disorder, be-

cause as the lesions are the result of inflammation in most cases, and as it extends usually over the greater part or the whole of the ventricle, therefore, neither valve absolutely escapes. Still, as a trifling lesion is not sufficient to give rise to much or any notable disturbance, the symptoms very generally depend on the affection of the valve only which is most altered. The disorder of either semilunar or mitral will produce grave results, if carried to an extreme degree; but the mischievous effects are in general more severe in affections of the mitral than of the aortic valves. When the semilunar valve is contracted or dilated the cavity of the left ventricle remains full; for the blood is either prevented from passing quickly into the aorta, and thus accumulates in the ventricle, or it regurgitates into it: but if the mitral valve be much altered, the supply of blood becomes at once irregular, and the ventricle no longer contracts in a steady uniform manner. In such cases the pulse is most frequent and irregular, and the dyspnœa is then excessive.

The physical signs of valvular disease vary according to the valve affected, and the nature of the lesion. When contraction of the semilunar valves of the aorta predominates over dilatation, the blood is driven with difficulty through them by the contraction of the ventricle; hence, we have a bellows, or rough rasping sound developed, according to the degree of contraction, and the surfaces offered to the passage of the blood. The bellows sound depends chiefly on the increased violent muscular contraction produced by the resistance at the valves, and the rasping sound upon the irregular surface of the valve when there is actual ossification. Dilatation of the auriculo-ventricular valves produces the same result during the systole as contraction of the semilunar valves; that is, roughening in various degrees of the first or systolic sound, from the strong muscular effort necessary for the heart to free itself of blood; hence, this symptom is so frequent in valvular diseases, both at the orifice of the aorta and between the ventricle and auricle. The second sound is much less frequently roughened than the first; it is very often diminished in loudness by the disease of the semilunar valves, but it can only be roughened by their permanent dilatation, allowing the blood to regurgitate into the ventricle in such a way as to

produce a harshness of sound. Now, the simple reflux is not, in general, sufficient to produce this, the blood passing back almost noiselessly; it only takes place where there is a rough projection towards the cavity, interrupting the current of blood. Permanent contraction of the auriculo-ventricular valves, especially of the mitral, is sometimes carried to so great a degree as to interrupt the current of blood during the dilatation of the heart; and it then gives rise to a rough sound, replacing the natural second sound, or masking it.

The roughened sounds of valvular disease are not heard over the valves only, but they are conducted by the columnæ carneæ to the muscular portion of the heart; still, they are heard most loudly at a point nearest the valve affected.

Disease of the mitral valve produces an alteration of the sound which is most perceptible near the apex of the heart, very low down, and not so audible near the seat of the valves. It is obvious that attention to the position from which the morbid sound proceeds is the best means of distinguishing between a lesion of the mitral and semilunar valves, as in the latter case the roughened sound is always most perceptible at a much higher situation in the chest, and one which corresponds more nearly with the seat of the valve. The bellows or rasping sound is conducted along the parietes of the heart down to its apex. The position of the morbid sound in disease of the mitral valve is now generally admitted; the first to ascertain the fact was Dr. Pennock, of this city.

If several of the valves be simultaneously diseased, and the muscular substance of the heart be at the same time enlarged, the distinction between the first and second sound is in a great measure lost, and there is little more heard than a confused purring: when this occurs there is usually a thrilling sensation perceived by laying the hand on the exterior of the chest. This indicates a grave condition of the heart, constituting one of the most severe forms of disease of this organ, and scarcely ever allows the patient to survive long.

The valvular diseases, like other organic affections, are attended with many painful sensations in the chest. As they are, in general, complicated with disease of the muscular substance, it is dif-

ficult to say what portion of their symptoms should be ascribed to the valvular, and what to the muscular disease. If the valves are so much diseased as to materially impede the action of the heart, it is reasonable to infer that the pectoral symptoms depend chiefly upon them. If the valvular disorder be less, the action of the two lesions is a joint one, and it is impossible to separate them. In some patients, angina pectoris, or a painful stricture of the chest, extending down the left arm, complicates the disease, and may cause intense suffering. In nearly all do we find that violent attacks of dyspnœa follow exercise, or any other stimulants of the action of the heart, or disturbance of the pulmonary circulation. When the heart is calm, the suffering of the patient is very slight, and is often limited to a mere disagreeable sensation in the chest, with occasional attacks of palpitation, which are much more severe when the mitral valve is affected than any other. The complication of acute inflammation of the internal membrane of the heart is by no means infrequent, and will always give rise to considerable pain and great increase of the dyspnœa. Congestions of the lungs are favoured by disease of the valves, especially of the right side of the heart, more than by any other lesion of the organ, and are often the chief cause of the violent oppression.

Of the secondary affections, dropsical effusions in the chest and in the cellular tissue generally, are the most frequent. It has been previously mentioned that these are confined to no form of heart disease, but may occur in connection with any of them; most frequently, however, with those which are severe enough to impede the circulation, as one cause of the effusion is certainly the difficult passage of the blood through the cavities of the heart. Some observers have gone so far as to deny the occurrence of dropsy, except as a consequence of valvular disease: this is clearly erroneous, but the assertion shows that these lesions must, at least, be one of the most frequent causes of effusions. If the anasarca be not hastened by inflammation of the heart, it takes place rather later, after the disease of the valves has lasted a long time, and the red globules of the blood begin to be deficient. In some cases the effusion occurs first in the serous cavities of the chest, both in the pleura and pericar-

dium; but in the majority of cases anasarca precedes the thoracic dropsy. The face usually first becomes œdematous, then the anasarca shows itself in the hands, and afterwards in the lower extremities. When the patient is pale as well as anasarcous, and his strength materially diminished, the disease is usually very severe, and approaching to a fatal termination.

The pulse is extremely often irregular or intermittent when there is disease of the mitral valve, whether it remain patulous during the contraction of the heart, or be in itself so much contracted as to impede the passage of the blood. In disease of the aortic valves, however, the irregularity of the pulse is by no means so constant a symptom, being confined to those cases in which there is extreme contraction. Sometimes the pulse may be distinctly seen beating in every part of the body; this phenomena is characteristic of aortic regurgitation. I have sometimes, but very rarely, observed a pulsation extending along the veins of the back; this symptom I am of course disposed to attribute to contraction of the tricuspid valve, or to dilatation of the valves of the pulmonary artery, causing the blood to regurgitate in the veins.

The general aspect of the patient is more characteristic of heart disease when the valves are affected than in any other variety, because the obstruction to the circulation, which gives rise to these symptoms, is the most severe. Hence, the bluish tint of the lips, the prominence of the eyes, slight puffiness of the face, and the peculiar physiognomy of cardiac diseases, are most apt to be developed; these are uncertain, but probable indications of the disorder. Congestions and hemorrhages are less apt to occur when the valvular lesion predominates than when the muscular tissue is hypertrophied, because the blood globules are least altered in the latter case, and congestion therefore often occurs, instead of serous effusions. When the case is one of extreme valvular disease the whole body suffers as in other cases of cardiac disorder, the digestion fails, and emaciation and extreme pallor of the complexion usually follow.

The *diagnosis* of valvular diseases cannot be determined with certainty, except by the assistance of physical exploration. We may infer that the valves are diseased if the patient complains of great oppression, and distressing, fatiguing palpitation, and

at the same time becomes œdematous; but unless the alterations of the sounds of the heart, characterizing the disease of the valves, should be heard, the diagnosis is still uncertain. The *prognosis* of the disease is uniformly a grave one; if the disease occur very late in life, and depend rather upon ossification than upon a cartilaginous deposit, it does not shorten life unless carried to an extreme degree; but when the function of the valves is decidedly interrupted, we have then not only to anticipate a fatal termination, but one much earlier than would be expected in other heart disorders. Death may take place suddenly by an abrupt cessation of the action of the heart, or occur slowly from the exhaustion and dropsical effusions which follow protracted cases of this disease. Slight lesions of the valves sometimes, however, do not seem to shorten life; the general and physical signs sometimes continue through a long life, especially when the patient is sufficiently at his ease to avoid extreme muscular exertion.

The following rules for the diagnosis of the valvular disorders are laid down by Dr. Hope and Dr. Pennock, p. 365 (American edition), and are nearly correct; but there must always remain a share of doubt as to the precise diagnosis of the special lesion of each valve when several of them are simultaneously affected.

"*Signs of Disease of the Aortic Valves.*—One of the murmurs above alluded to is heard during the ventricular contraction (i. e. with the first sound) on the sternum, opposite to the lower margin of the third rib, and thence for about two inches or more upwards, along the course of the ascending aorta towards the right; and it is louder in these situations than below the level of the valves. Its pitch or key is usually that of a whispered *r*, from being superficial, and it accordingly conveys the idea of being pretty near to the ear. When a murmur of this kind is considerably louder along the tract of the ascending aorta than opposite to its valves, and is, at the same time, unusually near-sounding and superficial—in other words, on a higher key than a whispered *r*, it proceeds from disease of the ascending aorta itself. As the murmur from this cause is audible in the situation of the valves, it might lead to the supposition that they also were diseased, and it is sometimes very difficult to ascertain positively

that they are not. That a murmur is seated in the aorta, and not in the pulmonary artery, may be known by its being inaudible or very indistinct high up the course of the pulmonary artery, while it is distinct high up that of the aorta. That a murmur is seated in the aorta or its valves, and not in the auricular valves, may be known by its sounding loud and *near* above the aortic valves, where an auricular murmur, if audible at all, sounds feeble, *remote*, and on a low key, like a whispered *who*.

"When there is regurgitation through the permanently open aortic valves, a murmur accompanies the second sound, and its source may be known by the following circumstances:—1. It is louder and more superficial opposite to and above the aortic valves than about the apex of the heart, by which it is distinguished from a murmur in the auricular valves with the second sound. 2. It is louder along the course of the ascending aorta than along that of the pulmonary artery, and down the tract of the left ventricle than down that of the right; by which circumstances its seat is known to be in the aortic, and not in the pulmonic valves. This inference is strongly corroborated by the state of the pulse, which, when the aortic regurgitation is at all considerable, is singularly and pre-eminently jerking—the pulse of unfilled arteries. 3. It is distinguished from a systollic murmur in the aortic orifice by its accompanying the second sound; by its being more audible (though with a gradual diminution) down the course of the ventricle than a systollic murmur; by its being prolonged through the whole interval of repose, and even through accidental intermissions of the ventricular contraction; and by the weakness of the refluent current always imparting to it the softness of the bellows-murmur, an inferior degree of loudness, and a lower key, like whispering the word *awe* during inspiration. It often becomes musical.

"[The duration of the murmur in the second sound produced by the regurgitation of blood through the aortic orifice will depend upon the facility of closure of the aortic semilunar valves. If the obstructive disease be slight, so that the valves soon close by the recoil of the arterial column upon them, but a slight jet of blood will pass between their edges. The murmur thereby produced is represented by Williams, by the articulate symbol

of *trrht*, or *tzzt* (instead of *dup*). Should the valve remain permanently open, the abnormal sound from regurgitation, instead of being of short duration, may continue during the whole period of the diastole.—P.]"

"*Signs of Disease of the Mitral Valve.*—When the valve is permanently open, admitting of regurgitation, the first sound is attended with a murmur. It may be rough (rasping), or smooth (bellows-murmur), according to the nature of the contraction [the force of the circulation and the character of the blood], &c. (p. 107). Its key is low,—more or less like whispering *who* (p. 110); yet it sounds loud and *near* if explored about the apex of the heart, and a little to the sternal side of the nipple. It may thus be easily distinguished from a direct semilunar murmur, which, in this low situation, always sounds feeble and *distant*. The murmur in some cases completely drowns the natural first sound on the left side: in others, the sound can be distinguished at the commencement of the murmur.

"I have found preceptible purring tremor to be produced more frequently by regurgitation through the mitral valve than by any other valvular lesion—especially when the ventricle was hypertrophous and dilated, by which the refluent current was rendered stronger.

"If the regurgitation be considerable, but not otherwise, the pulse is more or less small, weak, intermittent, irregular and unequal (p. 359); and this, even though the impulse of the heart be violent.

"When the mitral valve is considerably contracted, a murmur (best heard in the same situation as the murmur from regurgitation, and distinguishable in the same way from semilunar murmurs) attends the ventricular diastole and second sound. From the weakness, however, of the diastolic current out of the auricle, the murmur is always very feeble, soft like the bellows-sound, and usually on a rather lower key than a whispered *who* (p. 110). I have found this murmur absent unless the contraction of the valve was considerable; for the blood had still sufficient room to pass with tranquillity: and I have also found it absent when the contraction was *great*—when, for instance, the aperture admitted one finger only, or merely a quill, provided the current

was preternaturally weakened by softening, by extreme dilatation of the heart, or by both. In such cases, however, the mitral disease would not be overlooked, as there is almost invariably a murmur from regurgitation. On the whole, this murmur is exceedingly rare, though Laennec and authors in general have supposed quite the contrary, from mistaking for it the murmur of aortic regurgitation (see p. 103).

"I have never known purring tremor accompany a diastolic mitral murmur, the current being too feeble to produce it.

"When the contraction of the mitral valve is great, the pulse (whether there be regurgitation or not) is more or less small, weak, intermittent, irregular, and unequal, in consequence of the supply of blood to the left ventricle being insufficient and irregular (p. 359). I have known the same to be occasioned by a polypus choking up the left auricle."

The pulmonary valves are scarcely ever thickened; they are not unfrequently dilated, however, from partial distention or yielding of the tissue. In these cases, we cannot readily make more than a merely probable diagnosis, from the sounds running nearer to the ear than if produced by the aorta.

The lesions of the tricuspid valves are so rare, and the difficulty of diagnosis so great, that Dr. Hope very properly cautions practitioners against attempting a positive diagnosis.

The *treatment* is necessarily purely palliative; it is therefore totally different from endocarditis, in which directly curative means are to be looked for. Our object is to prevent, as far as possible, the frequent return of the fits of palpitation and dyspnœa, and to check the further increase of the morbid deposits. A little knowledge of the usual causes of the paroxysms is soon acquired by the patient, and will in general prevent him from needlessly exposing himself to them. He must learn to lead a quiet unexcited life, and if his temper be placid, a simple attention to hygienic rules will often effect something very nearly approaching a cure; that is, if the disease be not excessive. Many individuals, however, are unfortunately so situated in life, and are of such temperaments, that it is scarcely possible for them to avoid a renewal of the attacks of dyspnœa; hence the disease is hastened in its progress by causes which are not

inherent in it. When the attacks occur and cause great oppression, nearly the same treatment should be adopted as in other cases of irregular action of the heart. There is, however, rarely occasion for bloodletting; nor, indeed, are there many cases in which it would not be positively injurious; for, as the pallor of the blood is extremely apt to follow protracted valvular disease, we should carefully abstain from any treatment at all fitted to hasten this change. Cupping is extremely useful where a recent attack of cardiac inflammation supervenes: but under other circumstances it is unnecessary. Complete repose, sinapisms on the chest, and revulsive pediluvia, are extremely beneficial, and are often sufficient to relieve the attack. As internal remedies, Hoffman's anodyne, with a few drops of the aromatic spirit of ammonia, in the proportion of half a drachm of the former to fifteen drops of the latter, is one of the best means of quieting the action of the heart and of gently stimulating the capillary circulation. Assafœtida, with other similar antispasmodics, such as from three to five grains of camphor, and two or three of Dover's powder every two or three hours, are often useful. Often, when the attack is passing off, digitalis may be advantageously administered, either alone, or, as is still better, combined with assafœtida, or Hoffman's anodyne.

The principles of treatment are, therefore, plain enough, and so far as our means extend, they will be found efficacious; unfortunately we are soon arrested in their administration. But as the most severe organic disorders of the heart do not necessarily shorten life if they are not thrown into action, the case is not always attended with such imminent danger as might at first be supposed. The best test of an approaching termination is the condition of the capillary circulation.

There are several organic affections of the heart which are rarely met with, and never present symptoms sufficiently well defined for us to recognise them; hence, they rather belong to

pathological anatomy than to pathology, properly so called. Amongst these are ulcers of the substance of the heart, gangrene of its tissue, pouch-like aneurisms formed by digital cavities beginning at the heart and ending in short cul de sacs at a little distance from it. To the practical student of disease they are, therefore, not of more interest than suppuration of the muscular tissue of the heart, which is extremely rare, and not susceptible of recognition.

Atrophy of the heart is a frequent consecutive disorder; that is, it often accompanies cases of phthisis and other disorders, attended with great emaciation, in which the heart participates like other organs of the body. Softening of the tissue of the heart is also but a part of general softening of the muscular system; it takes place in cachectic conditions of the system, in which the blood is more or less altered, especially in low forms of fever. The softening diminishes the force of impulsion of the heart; and auscultation is under these circumstances a good means of estimating the extent and development of the lesion. Cases in which the heart becomes softened, bear and often require the liberal use of stimulants; hence, in a therapeutic view, it is often important to ascertain when this condition exists.

CHAPTER XXIII.

FUNCTIONAL DISEASES OF THE HEART—PALPITATION—PAIN—INTERMITTENCE—ANGINA PECTORIS.

These are extremely frequent, and strange to say often appear more severe to the subjects of them than the organic alterations. They are usually connected with an excitable nervous temperament, which renders the sufferer irritable, watchful of slight sensations, and apt to complain of the least aberration from the healthy condition: organic diseases of the heart, on the other hand, acquire new intensity, and are doubly distressing to the patient if a functional disorder be added to the organic lesion. The functional disturbance of the heart is extremely protean in its character; sometimes it is not sufficiently defined to admit of classification as a distinct symptom or group of symptoms; at other times the nervous disorder is perfectly well marked, and retains its characters for a long period. As a general rule, we apply the term nervous disorder to many different states. The principal are:

1. *Palpitation.* This may be, as mentioned, a sign of a true organic disease; but when it is really most troublesome, it is often not connected with a permanent lesion. In these cases it occurs suddenly, chiefly from mental impressions, or other causes, acting directly upon the nervous system. It is most violent when dependant upon anemia, which is, of course, readily recognised by the pallor and general aspect of the patient. Violent exercise will produce the palpitation as much as it does in those cases which are dependant upon organic disease, but to a much less degree than moral causes. The tendency to palpitation is congenital with some individuals, and may last through a long life without the development of positive cardiac lesions. Nervous palpitations are readily excited

by stimulants acting directly upon the spinal axis, as excess of tobacco, coffee, and sometimes of venery: disorders of the stomach, temporary indigestions, &c., are all capable of bringing on violent attacks of palpitation, which cease soon after the immediate cause. These attacks come on frequently at night, when the patient is often kept awake by them for a long period; and the extreme distress they then occasion constitutes one of the most unpleasant forms of cardiac disease; they are thus usually connected with great disorders of the whole nervous system. Excesses in the use of tobacco have more influence than any single cause in producing this peculiar variety. If the ear be applied to the chest of a patient labouring under nervous palpitations, the two sounds are quite distinct: the second rather sharper than usual, and the first has occasionally more or less of the bellows character, especially if the patient be anemic. The impulsion of the heart is quick and decided, but there is no positive increase of force, no sensation similar to that of a large body striking against the walls of the chest, which is one of the best indications of hypertrophy.

2. *Pain* in the heart and near it is frequently a pure nervous symptom. It has been already stated that this, when acute, is more frequently a mere nervous sensation than a sign of organic disease. It is in some cases a pure neuralgia, sharp and lancinating, and extending from the spine to the neighbourhood of the heart, or along the ribs and to the epigastrium. Sometimes it alternates with pain at the latter situation, or with other disagreeable sensations. In other instances there is general soreness about a large portion of the chest, especially in the neighbourhood of the heart. All, or any of these sensations, may coincide with positive organic disease, but not necessarily so; they may be perfectly independent of it, and of no real danger, although causing extreme annoyance to the patient.

3. *Intermittence.*—Irregularity of the pulse is, as was before mentioned, both a functional and an organic symptom. It may exist throughout a long life without the development of any organic lesion. In some persons the symptoms assumes an extreme intensity, and may amount to positive syncope—the patient fainting under slight impressions,—totally inadequate,

under ordinary circumstances, to produce such a result. This condition, like the other symptoms alluded to, may occur as a mere attendant upon organic disease, but it is more frequently a purely nervous symptom.

4. *Angina Pectoris* is ranked in most works as a separate disease, that is, as having a definite train of symptoms capable of being separated from other affections of the heart. This view of the subject is not, however, at present regarded as the most tenable one; on the contrary, the group of symptoms called angina pectoris is understood to depend upon a functional disease of the heart allied closely to gout, or upon various organic lesions, especially ossification of the valves, which is often dependant upon a gouty more than upon a rheumatic diathesis. The symptom, it is well known, consists in an intense feeling of dyspnœa, with pain extending down the arms, usually the left arm only. The dyspnœa comes on very suddenly in most instances, usually after some excitement of a mental kind, or after active bodily exertion. If the attack be extremely severe death may occur during the paroxysm; but in most cases the attack passes off in a few minutes, leaving the patient comparatively well after intense suffering. The extension of the pain down the left arm is one of the most remarkable features of the disorder; the same symptom may occur when there is pain of a mere neuralgic character, but then it is comparatively slight.

Angina pectoris is most readily relieved by diffusible stimulants, as Hoffman's anodyne, ether, and the like. The usual revulsives to the spine and anterior part of the chest, which relieve so many of the neuralgic diseases of this cavity, are also of great benefit. The principal object of our treatment, however, is certainly to prevent the recurrence of the symptoms; to effect this object, the treatment must be directed to the removal of the cause. The organic affection, on which it commonly depends, is, unfortunately, incurable in the majority of cases, but a careful attention to the exciting causes of the disease will exercise at least some control over the recurrence of the paroxysms.

Although no one treatment can be adopted in the management

of functional disorders of the heart, nevertheless, certain general indications are well settled. If functional disease is not connected with organic, a debilitating treatment is injurious; the best means are the application of counter-irritants, especially of the milder superficial irritants, such as repeated weak sinapisms, frictions with hot salt and the like, from time to time; when there is a sharp pain at the heart, small blisters, frequently reapplied, will remove it sooner than almost any other remedy: the deeper counter-irritants, as tartar emetic, issues, and setons, do not seem so well fitted for these cases as those whose action is more diffused, but more equable. Amongst the internal remedies suitable for those cases in which tonics are necessary, the infusion of the wild cherry is one of the most agreeable to the stomach, at the same time that it exerts a directly calming action upon the irritability of the heart; in no disease is this remedy of so decided benefit as in cases of nervous palpitation connected with feebleness of the system. Chalybeates are not necessary, and scarcely useful, except in palpitations dependant upon anemia, especially if occurring in chlorotic girls.

Assafœtida and Hoffman's anodyne, and camphor if given in doses of three to five grains three or four times daily, answer very well in certain cases of nervous disorder. A careful avoidance of excesses of all kinds, night watching, all stimulating drinks, including tea and coffee, and of tobacco, will often suffice to cure a nervous disorder. A change of residence, and the abandonment for a time of an absorbing occupation; the removal, if possible, of mental causes of uneasiness, with gentle exercise, country residence, and simple nourishing diet, are in severe cases indispensable. Marriage is often followed by a complete removal of the symptoms, much to the surprise of the patients, who are often much more uneasy on account of mere nervous palpitation than of real organic lesion.

CHAPTER XXIV.

DISEASES OF THE AORTA—AORTITIS—ANATOMICAL CHARACTERS—SYMPTOMS—DIAGNOSIS—PROGNOSIS—TREATMENT.

Inflammation of the aorta has been scarcely studied, except of late years; but it is now known that it is by no means a very infrequent disease. The aorta participates in the liability to inflammation, which is so characteristic of the red blood cavities of the heart. In many instances the inflammation merely extends from the left ventricle downwards into the aorta, and the disease remains the same, but a larger portion of the arterial tissue is affected than in cases of endocarditis, where the heart alone is inflamed.

The anatomical characters of the affection are less decided even than those of endocarditis; for the force of the current of blood is greater, and, of course, the lymph which is thrown out during the inflammation adheres with more difficulty to the membrane. There is the usual redness of inflammation, not regularly diffused over the membrane, as in cases of mere cadaveric redness from imbibition, but shaded in different degrees of intensity, and in irregular patches; like the other signs of inflammation, it is most evident about the arch of the aorta, where the disease is earliest developed. The redness sometimes allows the minute vessels and fine dots of which it is composed to be distinctly traced; in other cases they are confounded with the general shading. The lymph, in part, adheres to the membrane, that is, those portions of it which are early organized, and form, as it were, a continuous whole with it; sometimes there are granulations and irregular vegetations, as in cases of endocarditis; they arise merely from the irregular deposition of the lymph. In a few rare cases, ulcers are developed at the bottom of the deposits of lymph, and the internal membrane is afterward gra

dually removed by the ulceration; but they are not common, except in the more chronic forms of the disorder, when cartilaginous matter has replaced the original secretion of lymph, and ulceration takes place below it. All the coats of the aorta are in some cases thickened. The internal membrane is in bad cases softened, and is often of a dull yellowish tint—a condition which indicates an approach to gangrene. I have often seen these patches of softened tissue extend throughout the greater part of the aorta; but in most instances they are confined to the arch of the aorta and the thoracic portion. The products of inflammation are, therefore, nearly similar in inflammation of the lining membrane of the aorta and of the left ventricle; but as the office of the artery is simply to serve as a channel for the blood, instead of being an active propelling power like the heart, the distress produced by arteritis is less considerable.

Symptoms.—The symptoms of aortitis are often very obscure. In many cases there is unusual uneasiness deep in the chest, rarely amounting to defined pain; it is often a mere sense of oppression, or of extreme dyspnœa; these symptoms, however, vary in an extreme degree, and though scarcely ever totally absent, are sometimes so badly defined that they almost escape the attention of the physician, and are, at least, badly described by the patient. In some cases the orthopnœa is quite as intolerable as in any other affection of the chest; but this is not the case with the majority of patients. The palpitations are at times perceptible by the patient, but not as a general rule; the impulse of the aorta may usually be felt by pressing the finger behind the top of the sternum; and by applying the stethoscope or the ear upon the upper third of the sternum the impulsion is quite distinct. The circulation is nearly always more or less disturbed; few patients escape entirely without fever; in some the fever is very intense, and one of the most marked symptoms of the affection; and though not always a well-developed symptom it is so in many instances. The heart itself participates in the affection, and the impulsion is often nearly as strong as that of the aorta, but it is chiefly in cases more or less complicated with inflammation of its lining membrane. Cough and expectoration scarcely belong to inflammation of the aorta; the former may exist in a

slight degree, but the symptoms rather belong to some associated affection of the lungs than to the inflammation of the aorta. As in all cases of fever many secondary symptoms, such as loss of appetite, cephalalgia, and constipation, may accompany aortitis, and if the abdominal aorta be inflamed, some local uneasiness, corresponding to this part, may be felt; but as the symptoms are not at all peculiar, and are very irregular, little attention is generally given to them. Besides the mere increase of impulsion, a sawing sound, that is, the double rasping sound, may often be heard distinctly at the upper portion of the sternum; one part of the sound corresponding with the onward motion of the blood, and another with the partial reflux which seems to occur in those cases, from what cause would be easy to imagine, but difficult to prove. This sign, however, is chiefly heard when the inflammation has produced a partial disorganization of the coats of the artery, if not amounting to aneurism, at least to thickening.

The termination of a case of aortitis is of course various; the large majority of cases recover, but if the aortitis occur as secondary to some other disease, or if it be very violent, either from unusual extent or peculiar constitution of the patient, it may be fatal at a very early period. Like endocarditis, it may terminate in recovery from the acute period; but thickening of the aorta, cartilaginous deposits, and other alterations, may remain long after the cessation of the febrile excitement, and at last terminate in aneurism from the giving way of the weakened internal coat.

Diagnosis.—The diagnosis of the disease is in many cases involved in much difficulty. As the pain is extremely irregular, at times quite insignificant, at others severe, but generally not limited to a particular portion of the chest, and not accurately corresponding with the position of the aorta, it is of little value as a diagnostic sign, unless it is seated at the upper part of the sternum, that is, very near the arch. The fever and disturbance of the circulation are of much value if conjoined with strong throbbing, or a sawing sound at the region of the arch. In some cases there is serous effusion throughout the body as in other cases of disease of the circulation. Lastly, we have negative signs as regards most other affections of the heart or lungs

capable of producing analogous symptoms; hence the diagnosis, by way of exclusion, is then of great assistance to us. If, however, the heart or lungs be affected at the same time with the aorta, we can only rely upon the positive indications of aortitis, few as they may be, and the diagnosis is therefore often uncertain. A careful examination of the symptoms added to an estimate of their relative value will, however, generally make the case clear.

Prognosis.—The prognosis is in general not unfavourable. If the dyspnœa be very violent and does not yield to bloodletting it is an unfavourable sign; lividity of the countenance, and large serous effusions throughout the body, are among the worst symptoms. Where aortitis occurs in persons much enfeebled, or suffering under previous disease, it is always severe, and the prognosis must then be regarded as most unfavourable.

Treatment.—The treatment is of course decidedly antiphlogistic. If the affection be discovered at an early period, full bloodletting is of course the best means of subduing the inflammation, and of removing the condition of the blood which accompanies it. It may be necessary to repeat the bleeding more than once. Leeches above the sternum approach very near the arch of the aorta, and produce a much more decided influence than we could suppose would be the case. The usual antiphlogistic treatment must accompany the depletion—antimony in small doses, opium and ipecacuanha, mercurials—and, finally, when the inflammation has almost subsided, digitalis is indicated in the declining stages of the disease, and must be administered according to the usual rules on this subject. Absolute rest should be insisted upon for a long period, and the diet should be as simple and as light as possible.

Both aortitis and endocarditis are sometimes associated with acute or inflammatory phthisis, and the tuberculous disease may be at first overlooked, or not developed until the excitement of the circulation diminishes. The treatment of such a complication does not offer any thing peculiar in its character; after the subsidence of the acute symptoms, however, the patient must be watched with great care for a considerable period.

CHAPTER XXV.

ANEURISM OF THE AORTA — ANATOMICAL CHARACTERS — SYMPTOMS — DIAGNOSIS — PROGNOSIS — TREATMENT.

One of the terminations of aortitis is in aneurism, especially of the arch; this usually supervenes on the giving way of the internal membrane, so that the blood passes between it and the middle coat; in some rare instances the blood finds its way for a long distance between the two coats, constituting a variety of dissecting aneurism; this is, however, an exception. Although aneurism of any portion of the aorta is regarded as a strictly medical disease, yet that of the thoracic portion alone belongs to our present subject, and in the majority of cases will be found to depend directly upon inflammation and softening of the internal coat. In some cases, however, the influence of inflammatory action either cannot be traced at all, or so remotely that the cause becomes at last doubtful; this is especially the case with persons much advanced in life, whose aorta is studded with bony and cartilaginous plates, the origin of which, in a good proportion of cases, we have every reason to believe inflammatory, like that of the same deposits in the internal membrane of the heart. The distension of the aorta from the stretching of all its coats is by no means infrequent at the arch; it never reaches the size observed in false aneurism, and unless it should afterwards be converted into the latter variety does not, as a general rule, endanger the life of the patient.

Anatomical Characters.—The anatomical characters of aneurism of the aorta are so well known as scarcely to require a complete description. In the variety termed true aneurism the aorta reaches various degrees of distension, with thickening of its coats; the openings of the arteries leading from the arch are occasionally much contracted, so as to admit with difficulty

the passage of the blood: in one case I have seen the current of the blood diverted from the three arteries of the arch and turned into collateral channels; in this case there was no pulsation perceptible at the wrist. If the aneurism be large enough the trachea is often pressed upon, and the respiration becomes difficult. The heart may remain in the healthy condition, or may participate in the original inflammation and the results of it. When diseased, it generally presents the traces of previous endocarditis, and various degrees of thickening and other alterations of the lining membrane.

In the variety which is much more common, and is sometimes styled false aneurism, the appearances on dissection are similar to those so fully described in surgical works that it is not necessary to enter into a minute description. The internal membrane gives way from softening and ulceration, and the blood percolates through the opening; the lining membrane is gradually absorbed as the aneurismal tumour enlarges, while a portion of sac is gradually filled with fibrin, which is deposited in layers, until it forms a mass which may attain a very large size. The blood passes by the side of, or through an opening in the fibrinous mass, which is irregular in size and more or less obstructed, so that a smooth passage is no longer left for it. The disease terminates in two ways; by the gradual pressure upon the trachea and lungs producing disorder of these organs, often of a tuberculous variety, and by rupture of the tumour causing sudden death from hemorrhage. In a few cases death may follow from paralysis, caused by the caries of the spinal column. Absorption of the bones of the chest always takes place if the tumour comes in contact with them; they may be the sternum and the anterior portions of the ribs, or the bodies of the vertebræ, if the tumour happens to enlarge in that direction. If the anterior parts of the chest are absorbed, a tumour forms which sometimes yields a distinct pulsation, but towards the spine an external pointing of the tumour can scarcely take place. In many instances, death does not result from the aneurism, but the patient is carried off by some accidental disease not immediately connected with the lesion of the aorta.

Symptoms.—The symptoms of aneurism are chiefly the phy-

sical signs—those connected with the obstruction to the passage of the blood, and lastly, the secondary effects produced by the immediate pressure, or the obstruction of the circulation upon other organs. The growth of the aneurism itself is attended with little or no pain; for the aorta, when attacked by chronic disease, is scarcely susceptible of painful sensations. The physical signs at first are limited to a strong pulsation at the arch of the aorta when the aneurism is seated there, which may be felt by pressing the finger downwards behind the top of the sternum, or may be recognised by applying the ear or the stethoscope at the upper part of the sternum. The percussion is affected to so slight a degree at the commencement of aneurism that it is not a sign of much value; but as the lesion increases in size, we often find that the sound becomes dull over a considerable extent at the upper third, or even half of the sternum. Sometimes, when the aneurism is very large, the dullness extends on one side or the other of the sternum, according to the situation of the tumour. The pulsation usually increases in force, but not invariably, for the current of blood is not always propelled in such a way as to strike forcibly against the sternum. In most cases, too, there is a very evident *bruit de scie*, or sawing sound; this is perceptible both in the first and second sound, being caused by the partial reflux of the blood, and is easily distinguished from the simpler rasping sound heard at the region of the heart. With these sounds there is often a decided thrill. It would be very easy to recognise aneurism of the aorta if all these signs were present in every case, but this is not so; the only permanent one is the dull percussion, and even that is sometimes difficult to recognise if the aorta enlarges on its posterior, and not its anterior surface. But although the signs are often obscure, they are rarely altogether absent, and with attention may generally be detected from time to time, the percussion being always permanently dull.

The general symptoms are in some cases almost as imperfect as the physical signs. Those most directly connected with the aneurism are the disturbance of the circulation, both at the heart and in the arteries. The pulse is in some cases thrilling, which is almost a pathognomonic symptom when present in a

well-marked degree of aneurism, but it is often quite regular and natural, even in cases in which the aneurismal tumour is large, but is not so formed as to obstruct the passage of the blood. The uneasiness of the chest is at times very slight, but when the trachea is pressed upon, the dyspnœa becomes extreme, and a convulsive cough occurs in paroxysms, having some resemblance to attacks of pertussis. The pain in the chest is often neuralgic, from pressure on the sides of the dorsal vertebræ; and from the same cause, instead of being confined to the thorax, it may extend throughout a large portion of the body. The effects of pressure on the neighbouring organs are so various that all the viscera in the thorax may be involved; so that the diagnosis of the disease is thus rendered much more obscure in consequence of the secondary disturbance of the organs which are not immediately connected with the heart. They are therefore of little diagnostic value, except as connected with some local indications of aortic disease. The other organs than those of the chest are not directly connected with the enlargement of the aorta, and sympathise only as the disorder of the circulation extends itself throughout the system.

Termination and Prognosis.—The termination of this disease is almost necessarily fatal; that is, the disease is at least practically incurable, but the patient may live for a long series of years, and at last die of a disease not connected with aneurism. This is most frequently the course of the disease if the patient be of a quiet, placid turn of mind, and be placed in such situations of life as to free him from anxiety or laborious exertions.

Diagnosis.—The diagnosis of aortic aneurism, it is plain from the symptoms, must often be difficult. If the disease be so far advanced, and so near the surface as to produce all its physical signs, then the diagnosis is plain enough. Sometimes groups of enlarged lymphatic ganglia and induration of the anterior portion of the lung may give rise to signs not very dissimilar to those of aneurism. If the tumour has perforated the bony parietes of the chest, the diagnosis is of course evident enough. But it is most essential to recognise the disease at an earlier stage, when there are as yet no strongly-marked signs. The diagnosis is then mainly founded on that nice balancing of slight

symptoms which we term medical tact; hence, the presence of any of the physical signs of aneurism, with some of the local symptoms, such as dyspnœa, pain, &c., will make us sure of the existence of the disease, provided no indications of other disease of lungs or heart, which could explain the symptoms, are found. If the aneurism be complicated with other thoracic diseases, then our diagnosis by exclusion fails us, and we must trust mainly to the direct signs, and then examine whether the symptoms are not more connected with a lesion of the circulation than of the lungs. If we ascertain that the seat of the disease is the heart and aorta, but not the lungs, there is little further difficulty in settling the diagnosis as one of aneurism, either simple or complicated with heart disease.

Treatment.—In a disease of this nature the treatment is obviously palliative. When an aneurism is once fairly formed we possess no means capable of curing it; all that we can attempt to do is, to prevent as far as possible the further rupture of the coats of the artery, and to favour the formation of coagula in the sac. The patient should, as he values his life, remain as quiet as possible, if not in a state of absolute repose; he should take no severe exercise, especially none which produces much excitement of the circulation, or requires strong efforts of the muscles of the upper part of the body. The diet should consist of the simplest and least stimulating articles of food, not only because they exercise a directly injurious effect on the circulation, but because indigestion and flatulence always increase the severity of the symptoms of diseases of the heart or aorta. Occasionally we may take blood to quiet the circulation when the heart is driving the blood with extreme force through the aneurismal tumour. The bleeding, should not, however, be repeated very often, as there is occasionally a disadvantage in taking away large quantities of blood. This doctrine is of course opposed to the old practice of treating aneurism, but I think it sometimes very evident that frequently-repeated bloodletting is often injurious to this disease. The bowels of the patient should be kept regular, although it is not advisable to use large or frequently-repeated doses of purgative medicines.

SUPPLEMENT.

SPIROMETRY.

A NEW method of measuring the chest by determining the permeability of the lungs to the air has lately been introduced to the profession by Dr. Hutchinson. The instrument used for this purpose is termed a Spirometer. This instrument has been since modified by Dr. Pereira, who has simplified very much the method originally proposed by Dr. Hutchinson. It is a large glass cylinder suspended by a cord in a vessel filled with water; the cord passes over a pulley, and has a weight attached to it to balance the cylinder in any position. "A pipe, forming the continuation of the tube through which the patient has to breathe, rises in the bell-glass close to the level of the water; and by forcing the air through this tube the vessel will ascend and indicate, by a graduated scale affixed, the quantity of air passed into it."

It was found by Dr. Hutchinson that the vital capacity of the chest, or the quantity of air which passes into and out of the chest, was modified by four circumstances: 1. By the height of the individual; 2. Age; 3. Weight; 4. Disease. Singularly enough, the height of an individual has a very great influence in determining his vital capacity. This is independent of the size of the chest of the individual; for even if tall men have small chests, or short men have large ones, their vital capacity however is proportioned to their weight and not to the size of their chests. Tall persons always have a much greater vital capacity than those of shorter stature; that is, it is intimately connected with the height of the patient and not with the development of

the chest. This result seems very singular, and not to be in accordance with our ordinary views upon the subject.

The weight and the age of an individual have, also, considerable influence in modifying the quantity of air inhaled. Any great addition to the ordinary weight will cause the individual to inhale a less quantity of air; but a slight increase of size will not modify the quantity inspired. The age modifies the power of inspiration—which is at a maximum between the ages of thirty and thirty-five—diminishing afterwards.

Disease is a more important cause of variation. In cases of pulmonary phthisis just commencing, Dr. Hutchinson believes that he can often detect the presence of the disorder by the fact that the vital capacity of the patient is diminished before any other physical signs of the disorder exist. Dr. Davis, from whose lectures I have drawn this notice of Dr. Hutchinson's Memoir, agrees in the statement put forward by the latter gentleman. It seems to me, however, to be more than doubtful if an examination of the vital capacity of the chest could do more, in any case, than simply confirm the conclusions to which we would be led by an examination of the general symptoms of the patient. Besides, this method certainly would not be able to give us any idea of the various causes, as diseases of the heart or different affections of the lungs, which might alter the vital capacity of the chest. Practically I have not yet applied this mode of investigation, but I intend shortly to make a number of observations on the subject during the ensuing summer.

[The account of spirometry is taken from the January number of the Lancet (New York reprint, May), where it is published in a lecture of Dr. Davis. The original description of the instrument is given by Dr. Hutchinson in a number of the Medico-Chirurgical Transactions, which I could not find at the time these sheets were going to press.]

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